# Early-Run Chinook Salmon Creel Survey, Kasilof River, Alaska, 2002–2008

by

Jenny L. Cope

May 2011

Alaska Department of Fish and Game

**Divisions of Sport Fish and Commercial Fisheries** 



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Weights and measures (metric)		General		Measures (fisheries)		
centimeter	cm	Alaska Administrative		fork length	FL	
deciliter	dL	Code	AAC	mid eye to fork	MEF	
gram	g	all commonly accepted		mid eye to tail fork	METF	
hectare	ha	abbreviations	e.g., Mr., Mrs.,	standard length	SL	
kilogram	kg		AM, PM, etc.	total length	TL	
kilometer	km	all commonly accepted		-		
liter	L	professional titles	e.g., Dr., Ph.D.,	Mathematics, statistics		
meter	m		R.N., etc.	all standard mathematical		
milliliter	mL	at	@	signs, symbols and		
millimeter	mm	compass directions:		abbreviations		
		east	Е	alternate hypothesis	H₄	
Weights and measures (English)		north	Ν	base of natural logarithm	e	
cubic feet per second	ft <sup>3</sup> /s	south	S	catch per unit effort	CPUE	
foot	ft	west	W	coefficient of variation	CV	
gallon	oal	copyright	©	common test statistics	(E t $\chi^2$ etc.)	
inch	in	corporate suffixes:		confidence interval	$(I, i, \chi, i, out)$	
mile	mi	Company	Co	correlation coefficient	CI	
nautical mile	nmi	Corporation	Corp	(multiple)	P	
	07	Incorporated	Inc	correlation coefficient	ĸ	
pound	UZ Ib	Limited	I td	(simple)	*	
quart	at	District of Columbia	DC	(simple)	1	
yord	ų. vd	et alii (and others)	et al	dogroo (angular)	°	
yaru	yu	et cetera (and so forth)	etc	degrees of freedom	df	
Time and temperature		exempli gratia	cic.	averaged value	ui E	
		(for example)	A (1	expected value	L	
day	a	Federal Information	e.g.	greater than	>	
degrees Celsius	-C	Code	FIC	greater than or equal to	∠	
degrees Fahrenneit	°F V	id act (that is)	FIC i.a	harvest per unit effort	HPUE	
degrees kelvin	K	la est (mat is)	l.e.	less than	<	
nour	n		fat. of long.	less than or equal to	<u> </u>	
minute	min	Inonetary symbols	¢ ,	logarithm (natural)	ln	
second	S	(U.S.)	\$,¢	logarithm (base 10)	log	
		months (tables and		logarithm (specify base)	$\log_{2}$ etc.	
Physics and chemistry		figures): first three		minute (angular)		
all atomic symbols		letters	Jan,,Dec	not significant	NS	
alternating current	AC	registered trademark	®	null hypothesis	Ho	
ampere	А	trademark	IM	percent	%	
calorie	cal	United States		probability	Р	
direct current	DC	(adjective)	U.S.	probability of a type I error		
hertz	Hz	United States of		(rejection of the null		
horsepower	hp	America (noun)	USA	hypothesis when true)	α	
hydrogen ion activity	pН	U.S.C.	United States	probability of a type II error		
(negative log of)			Code	(acceptance of the null		
parts per million	ppm	U.S. state	use two-letter	hypothesis when false)	β	
parts per thousand	ppt,		abbreviations	second (angular)		
	‰		(e.g., AK, WA)	standard deviation	SD	
volts	V			standard error	SE	
watts	W			variance		
				population	Var	
				sample	var	

# FISHERY DATA SERIES NO. 11-18

# EARLY-RUN CHINOOK SALMON CREEL SURVEY, KASILOF RIVER, ALASKA, 2002–2008

by Jenny L. Cope Alaska Department of Fish and Game, Division of Sport Fish, Soldotna

> Alaska Department of Fish and Game Division of Sport Fish, Research and Technical Services 333 Raspberry Road, Anchorage, Alaska, 99518-1565

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Jenny L. Cope Alaska Department of Fish and Game, Division of Sport Fish 43961 Kalifornsky Beach Road, Suite B, Soldotna, AK 99669-8267 USA

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# TABLE OF CONTENTS

### Page

LIST OF TABLES	ii
LIST OF FIGURES	ii
LIST OF APPENDICES	ii
ABSTRACT	1
INTRODUCTION	1
Fishing Regulations	4
Objectives	5
2002	5
2003	5
2004	5
2005	5
2000	0 6
	0
METHODS	6
Effort, Catch, and Harvest	6
2002–2003	6
2004	7
2005–2008	ð
Age, Sex, and Length	9
RESULTS	10
Effort, Catch, and Harvest	10
2002	10
2003	11
2004	11
2005	13
2000	16
2008	16
Age, Sex, and Length	16
2002	16
2003	19
2004	19
2005	19
2000	20
2008	25
DISCUSSION	25
ACKNOWLEDGEMENTS	36
REFERENCES CITED	37
APPENDIX A. KASILOF RIVER EARLY-RUN CHINOOK SALMON AGE, SEX, AND LENGTH COMPOSITION, 2002.	[ 39

# LIST OF TABLES

Table		Page
1.	Kasilof River early-run Chinook salmon creel survey sampling summary, 2002-2008.	11
2.	Creel survey estimates of Kasilof River early-run Chinook salmon catch, harvest, and effort by angler category and method, May 16 through June 30, 2004	12
3.	Creel survey estimates of Kasilof River early-run Chinook salmon catch, harvest, and effort by angler category and method, May 16 through June 30, 2005	14
4.	Creel survey estimates of Kasilof River early-run Chinook salmon catch, harvest, and effort by angler category and method, May 16 through June 30, 2006.	15
5.	Creel survey estimates of Kasilof River early-run Chinook salmon catch, harvest, and effort by angler category and method, May 16 through June 30, 2007	17
6.	Creel survey estimates of Kasilof River early-run Chinook salmon catch, harvest, and effort by angler category and method, May 16 through June 30, 2008	18
7.	Creel survey estimates of harvest and length of hatchery-produced Kasilof River early-run Chinook salmon by age and sex, 2003	20
8.	Creel survey estimates of harvest and length of hatchery-produced Kasilof River early-run Chinook salmon by age and sex, 2004.	21
9.	Creel survey estimates of harvest and length of Kasilof River early-run Chinook salmon by age and sex, 2005.	22
10.	Creel survey estimates of harvest and length of Kasilof River early-run Chinook salmon by age and sex, 2006.	23
11.	Creel survey estimates of harvest and length of Kasilof River early-run Chinook salmon by age and sex, 2007.	24
12.	Creel survey estimates of harvest and length of Kasilof River early-run Chinook salmon by age and sex, 2008.	26
13.	Creel survey estimates of Kasilof River early-run Chinook salmon guided and unguided angler effort, 2005–2008.	32
14.	Naturally- and hatchery-produced Kasilof River early-run Chinook salmon estimated harvest, catch, and angler effort, 2004–2008.	33
15.	Kasilof River early-run percentage of hatchery-produced Chinook salmon harvested by day of the week, 2005–2008.	33

# LIST OF FIGURES

Figure	Pa	ge
1.	Creel survey access locations on Kasilof River, western Kenai Peninsula, Alaska.	2
2.	Naturally-produced proportion of the Kasilof River early-run Chinook salmon sport catch, 2003-2008	27
3.	Creel survey estimates of naturally- and hatchery-produced Kasilof River early-run Chinook salmon sport catch and harvest, 2004–2008.	28
4.	Creel survey estimates of guided and unguided anglers Kasilof River early-run Chinook salmon catch, harvest, and effort, 2004–2008.	30
5.	Creel survey estimates of boat and shore anglers Kasilof River early-run Chinook salmon catch, harvest, and effort, 2004–2008.	31
6.	Creel survey estimates of naturally- and hatchery-produced Kasilof River early-run Chinook salmon mean length composition, 2003–2008	34
7.	Creel survey estimates of Kasilof River early-run Chinook salmon sport harvest by age, 2003–2008	35

# LIST OF APPENDICES

Appen	ndix	Page
A1.	Kasilof River early-run Chinook salmon age, sex and length composition, 2002	41

# ABSTRACT

A harvest monitoring program estimating age, sex and length of Chinook salmon Oncorhynchus tshawytscha was conducted on the Kasilof River in 2002 and 2003. From 2004 through 2008, the program was expanded to include a creel survey estimating catch, harvest, and angler effort. The project was operated from May 16 to June 30 during all years except 2002 when it was operated from June 12 to June 30. Information collected in 2002 could not be used to generate estimates of harvest. Information collected in 2003 was combined with the Statewide Harvest Survey to estimate the age distribution of the harvest. From 2004 through 2008 catch, harvest, and angler effort estimates were generated from the creel survey for both naturally- and hatchery-produced Chinook salmon. From 2004 through 2008, mean estimated catch was 4,805 fish for naturally- and hatchery-produced Chinook salmon. Catches during this period ranged from 6,089 (SE = 596) in 2004 to 3,184 (SE = 402) in 2008. Naturally-produced catch during this period averaged 2,678 fish and ranged from 3,023 (SE = 300) in 2004 to 1,902 (SE = 231) in 2008. Hatchery-produced catch during this period averaged 2,047 fish and ranged from 3,066 (SE = 329) in 2004 to 1,222 (SE = 202) in 2008. From 2004 through 2008, mean estimated harvest was 2,440 fish for naturally- and hatcheryproduced Chinook salmon. Harvest during this period ranged from 2,665 (SE = 272) in 2005 to 1,984 (SE = 305) in 2008. Naturally-produced harvest during this period averaged 714 fish and ranged from 1,107 (SE = 170) in 2007 to 572 (SE = 79) in 2005. Hatchery-produced harvest during this period averaged 1,722 fish and ranged from 2,407 (SE = 271) in 2004 to 1,129 (SE = 193) in 2008. The mean number of anglers was 13,309 and mean angler effort was 62,152 angler-hours. Estimated number of anglers ranged from 12,015 (SE = 1,235) in 2004 to 16,248 (SE = 1,660) in 2006 and effort ranged from 51,854 (SE = 6,370) in 2004 to 75,258 (SE = 5,763) angler-hours in 2006. Naturally and hatchery-produced Chinook salmon catch, harvest, and effort estimates by angler type and method are also included in this report as well as harvest estimates by age class and sex.

Key words: Kasilof River, *Oncorhynchus tshawytscha*, Chinook salmon, creel survey, effort, harvest, age composition.

### **INTRODUCTION**

Kasilof River flows approximately 19.6 river miles (RM) from the outlet of Tustumena Lake to Cook Inlet (Figure 1). Its origin in the glaciers of the Kenai Mountains makes it turbid throughout the year. Four species of Pacific salmon including Chinook salmon *Oncorhynchus tshawytscha*, coho salmon *O. kisutch*, sockeye salmon *O. nerka*, and pink salmon *O. gorbuscha* are present in the drainage, as well as anadromous and resident steelhead/rainbow trout *O. mykiss*, Dolly Varden *Salvelinus malma*; resident lake trout *S. namaycush* and round whitefish *Prosopium cylindraceum* (Johnson and Weiss 2006). Sport fisheries exist for all Pacific salmon species present, although most of the fishing effort is directed towards Chinook salmon. The Kasilof River early-run Chinook salmon fishery is the subject of this report.

To increase sport fishing opportunity, the Alaska Department of Fish and Game (ADF&G), Fisheries Rehabilitation Enhancement and Development Division (FRED) constructed a hatchery adjacent to Crooked Creek in the early 1970s (Kyle and Litchfield 1989). Crooked Creek originates in the Caribou Hills and flows approximately 49.7 RM to its confluence with the Kasilof River at approximately RM 6.8 (Figure 1).

Crooked Creek originally had a stock of wild Chinook salmon. The enhancement program supplemented the wild return with hatchery-produced Chinook salmon smolt of Crooked Creek origin. Since the inception of the stocking program, the annual Chinook salmon escapement has been monitored through a weir at the Crooked Creek Facility (except 1997 and 1998). Escapement at Crooked Creek was comprised of wild salmon when the stocking program began. Some hatchery-produced salmon are used for hatchery production; however excess hatcheryproduced salmon are allowed to pass upstream of the weir and spawn. Because these naturallyspawning, hatchery-produced fish become part of the spawning stock, subsequent generations



Figure 1.-Creel survey access locations on Kasilof River, western Kenai Peninsula, Alaska.

may differ from the original wild stock. This mixed population will be referred to as *naturally-produced* in this paper. Naturally-produced fish made up 96% of the escapement in 1978, but declined in proportion as hatchery production increased during the 1980s (Todd 1990, unpublished data<sup>1</sup>).

The Crooked Creek Hatchery facility was operated by ADF&G through 1994, when Cook Inlet Aquaculture Association (CIAA) assumed operations (Nelson 1995). CIAA continued Chinook salmon escapement monitoring until 1997 when the facility was returned to ADF&G (Nelson et al. 1999). There was no activity at the Crooked Creek Facility during 1997 and 1998. ADF&G resumed escapement monitoring in 1999 (Bethe et al. 2002). From 1988 to 1996 the number of naturally-produced Chinook salmon was limited to 700 fish in the spawning escapement

<sup>&</sup>lt;sup>1</sup> Unpublished summary report, 1990, entitled Crooked Creek Chinook enhancement project 1990 summary report, by G.L. Todd, located at Alaska Department of Fish and Game, Soldotna.

(Gamblin et al. 2004, page 29). Beginning in 1999, the number of fish allowed upstream of the weir to spawn was increased to approximately 2,700 fish (Gamblin et al. 2004, page 29). The current management policy, adopted in 2001, requires ADF&G to achieve a sustainable escapement goal (SEG) at the Crooked Creek weir of 650–1,700 age-1.2+ naturally-produced adult Chinook salmon during the early run (Bue and Hasbrouck, 2001–2002, unpublished report<sup>2</sup>).

Not all of the hatchery-produced Chinook salmon used to supplement the sport fishery on Kasilof River were marked by an adipose finclip (AFC) until smolt release year 2000 (Diane Loopstra, ADF&G Division of Sport Fish, Anchorage, Alaska, personal communication). Consequently, returning fish to Crooked Creek and fish harvested from the Kasilof River were not completely discernable from naturally-produced Chinook salmon until 2004. Because marking commenced in release year 2000, ocean-age-2 fish were not detected until 2002 and ocean-age-3 fish were not detected until 2003. Since this time, 100% of hatchery-produced fish have been marked. All hatchery-produced Chinook salmon can be distinguished by a healed AFC while naturally-produced Chinook salmon can be identified by the presence of an adipose fin.

Fort Richardson Hatchery transitioned from a warm water rearing system to a cold water system in 2002. Warm water systems allow hatchery personnel to rear fish for 1 year and fish are released with a freshwater age of 0. Cold water systems require fish to be reared for 2 years and fish are released with a freshwater age of 1. In 2002, a double egg take was held at Crooked Creek to collect a sufficient amount of eggs to accommodate this transition. Half of the eggs collected were released as 0 check smolt in 2003 and the other half were released as 1 check smolt in 2004 (Andrea Tesch, ADF&G Fort Richardson Hatchery, Anchorage Alaska, personal communication). By 2008, all hatchery-produced fish harvested in the fishery were freshwater age 1. Naturally-produced fish are assumed to be freshwater age 1. For purposes of this report, only ocean ages will be presented.

The sport fishery targeting early-run Chinook salmon returning to Crooked Creek occurs on the Kasilof River, primarily from its confluence with Crooked Creek (RM 6.8) to its terminus at Cook Inlet, from May through June. Chinook salmon returning to Crooked Creek support a viable sport fishery on the Kasilof River. Initially, this was a shorebased, road accessible fishery with high levels of participation, but in recent years the fishery has expanded to the use of drift boats. Anglers utilizing drift boats access Kasilof River at the Sterling Highway Bridge (RM 8) and typically fish to RM 4.3.

The Kasilof River sport fishery for Chinook salmon was monitored for harvest and angler effort from 1978 to 1989 through a creel survey. In 1988, an informal creel census was conducted by the FRED Division in conjunction with their sockeye salmon smolt enumeration project. In 1989, sport fish catch was estimated by a stratified random sampling schedule for shore angler catches, and from a survey census of fishing guides for drift boat catches. After 1989, the sport fish harvest was not monitored again until 2002, when restrictions on the Kenai River Chinook salmon fishery caused concerns that fishing effort would shift to the Kasilof River. This concern prompted management biologists to monitor the sport harvest of Kasilof River Chinook salmon. An annual direct expansion, stratified creel survey has been conducted since 2004.

<sup>&</sup>lt;sup>2</sup> Unpublished report to the Alaska Board of Fisheries, November 2001 and February 2002, entitled Escapement goal review of salmon stocks of Upper Cook Inlet, by Brian G. Bue and J. J. Hasbrouck, located at Alaska Department of Fish and Game, Anchorage.

#### FISHING REGULATIONS

Although Chinook salmon do not enter Kasilof River in appreciable numbers until mid-May, by regulation, the king (Chinook) salmon season is open January 1 through July 31. The area open to Chinook salmon fishing extends from the Kasilof River mouth upstream to Tustumena Lake, although the area from the Sterling Highway Bridge and above is closed to Chinook salmon fishing from July 1 through December 31. Prior to 2002, sport anglers could harvest one Chinook salmon (naturally- or hatchery-produced) 7 days per week. Since 2002, the Kasilof River early-run Chinook salmon fishery has undergone many regulatory changes affecting harvest.

Kasilof River Chinook salmon regulations were modified by the Alaska Board of Fisheries (BOF) prior to the 2002 season. Motorized vessels were prohibited from fishing downstream from the Sterling Highway Bridge from January 1 through July 31 and similarly, motorized vessels were prohibited from fishing upstream of the Sterling Highway Bridge from January 1 through June 30. The daily bag and possession limit was one Chinook salmon per day 508 mm (20 inches) or more in length; annually, only three Chinook salmon could be taken from the Kasilof River. Fishing methods and means were restricted to no more than one single hook.

Further restrictions were implemented for fishing guides and guided anglers. Fishing guides were prohibited from fishing while with clients and were limited to one trip daily.

In 2002, the Kenai River early-run Chinook salmon fishing closure prompted restrictions on the Kasilof River. An inseason emergency order issued for June 14 through June 30 prohibited the retention of naturally-produced Chinook salmon (i.e., only Chinook salmon with a healed AFC could be retained through the end of the season). Additionally, anglers who harvested a Chinook salmon could not continue to fish for any other species in Kenai Peninsula waters where Chinook salmon fishing was open.

The prohibition on retention of naturally-produced Chinook salmon was put into regulation by the Alaska Board of Fisheries (BOF) for the 2003 and 2004 seasons. Regulations were also adopted stipulating that no person may possess a Chinook salmon that is filleted or disfigured to prevent AFC recognition until the fish is offloaded from a vessel or removed from a fishing site. The BOF also prohibited fishing from an anchored vessel near the confluence of Crooked Creek at the Crooked Creek State Recreation Site (commonly referred to as "People Hole") and invoked liberalizations regarding motor use in the lower reaches of Kasilof River (motors 10 hp or less may be used only downstream of Trujillo's Landing, and only after fishing from the boat has stopped for the day). Methods and means were changed allowing only one single hook from May 16 through June 30.

During the next BOF meetings, regulations for the 2005 sport fishery were liberalized allowing the retention of naturally-produced Chinook salmon 2 days per week (Tuesdays and Saturdays). The BOF also liberalized the annual harvest limit on Kasilof River Chinook salmon to five. Anglers were also allowed to fish with multiple hooks and bait from May 16 through August 31.

In 2006 and 2007, the harvest of naturally-produced (non-AFC) Chinook salmon was expanded by emergency order to include Thursdays.

For the 2008 fishing season, the BOF further modified the regulations to allow the harvest of naturally-produced fish on Tuesdays, Thursdays, and Saturdays. An additional sport fish regulation increased the bag limit for hatchery-produced Chinook salmon from one fish per

day/one in possession to two fish per day/two in possession. Bag limits on Tuesdays, Thursdays, and Saturdays (non-AFC days) could only include one naturally-produced fish.

# **OBJECTIVES**

# 2002

There was no operational plan and hence no formal, stated objectives for this fishery in 2002. Local area management biologists implemented an emergency order allowing only hatchery-produced (AFC) fish to be harvested from June 14 through June 30. Coinciding with the Kenai River early-run Chinook salmon closure, the ADF&G focused upon monitoring the harvest of early-run Chinook salmon from June 12 through June 30. Formal research planning commenced in 2003. Objectives associated with such planning are listed below.

### 2003

1. Estimate the proportion by age, sex, and length groups of Chinook salmon harvested in the early-run sport fisheries in Kasilof River such that each proportion is within 5 percentage points of the true value 90% of the time.

#### 2004

- 1. Estimate the proportion by age, sex, and length groups of Chinook salmon harvested in the early-run sport fishery in Kasilof River, May 16 to June 30, such that the estimates are within 6 percentage points of the true value 95% of the time.
- 2. Estimate the total catch and harvest of Chinook salmon by anglers exiting the Kasilof River access areas from May 16 to June 30, such that the estimate of harvest is within 15% of the true value 95% of the time.

In addition to the objectives above, the project was responsible for completing the following tasks:

1. Estimate sport fish angler effort in angler-hours.

#### 2005

- 1. Estimate the proportion by age, sex, and length groups of naturally- and hatcheryproduced Chinook salmon harvested in the early-run (May 16–June 30) sport fishery in the Kasilof River, such that the estimates are within 10 percentage points (naturallyproduced fish) or 7.5 percentage points (hatchery-produced fish) of the true value 95% of the time.
- 2. Estimate the total catch and harvest of naturally- and hatchery-produced Chinook salmon by anglers exiting the Kasilof River from May 16 to June 30, such that the estimate of harvest is within 25% of the true value 95% of the time.

In addition to the objectives above, the project was responsible for completing the following tasks:

- 1. Estimate angler effort in angler-hours for the early-run (May 16–June 30) sport fishery.
- 2. Collect baseline DNA tissue samples (axillary process) from unmarked sport-harvested Chinook salmon.

- 1. Estimate the total catch and harvest of naturally-produced Chinook salmon by anglers exiting the Kasilof River from May 16 to June 30, such that the estimate of harvest is within 30% of the true value 95% of the time.
- 2. Estimate the proportion by age, sex, and length groups of naturally- and hatcheryproduced Chinook salmon harvested in the early-run (May 16–June 30) sport fishery in the Kasilof River, such that the estimates are within 10 percentage points of the true value 90% of the time.

In addition to the objectives outlined above, the project was responsible for completing the following tasks:

- 1. Estimate angler effort in angler-hours for the early-run (May 16–June 30) sport fishery.
- 2. Estimate the total catch and harvest of hatchery-produced Chinook salmon by anglers exiting the Kasilof River from May 16 to June 30.
- 3. Sample sport-harvested Chinook salmon during the early-run fishery (May 16–June 30) for the presence of a radio transmitter, spaghetti tag, and/or tagging scar.

#### 2007-2008

- 1. Estimate the total catch and harvest of naturally-produced Chinook salmon by anglers exiting the Kasilof River from May 16 to June 30, such that the estimate of harvest is within 30% of the true value 95% of the time.
- 2. Estimate the proportion by age, sex, and length groups of naturally- and hatcheryproduced Chinook salmon harvested in the early-run (May 16–June 30) sport fishery in the Kasilof River, such that the estimates are within 10 percentage points of the true value 90% of the time.

In addition to the objectives outlined above, the project was responsible for completing the following tasks:

- 1. Estimate angler effort in angler-hours for the early-run (May 16–June 30) sport fishery.
- 2. Estimate the total catch and harvest of hatchery-produced Chinook salmon by anglers exiting the Kasilof River from May 16 to June 30.
- 3. Sample sport-harvested Chinook salmon during the early-run fishery (May 16–June 30) for the presence of an esophageal radio transmitter, spaghetti tag, and/or tagging scar.

# METHODS

# EFFORT, CATCH, AND HARVEST

#### 2002-2003

The 2002 and 2003 creel surveys were structured to maximize angler contact on the Kasilof River during the early-run Chinook salmon fishery. The creel survey was conducted from June 12 through June 30 in 2002 and from May 16 through June 30 in 2003. Interviews were conducted by shorebased technicians downstream of the Sterling Highway Bridge. Since access was limited, sampling effort occurred at two different boat pullouts (Cohoe Cove and Trujillo's

#### 2006

Landing) and one bank fishing area (Crooked Creek State Recreation Site). In 2003, an additional boat pullout was added (Kasilof Cabins) to the sampling design (Figure 1). The sport fishery was sampled 7 days per week. A schedule was designed to randomly sample during times of high use as well as proportionate to the harvest. If anglers were not present at sampling locations, technicians used their discretion to relocate to other access sites.

Anglers were interviewed as they exited the fishery at each access location. In order to avoid congestion due to the interview process, the interviews were brief and conducted as anglers secured their boats and gear for departure from the location. Technicians attempted to interview all exiting anglers. Data collected from each angler included time of day, access location, guided/unguided angler type or boat/shore angler type, finclip marking status, color of fish, sex, scale sample, and length for harvested fish and the number of Chinook salmon caught and released.

The sampling design did not permit estimates of 2002–2003 effort, catch, and harvest. Estimates of harvest by angler category and method are from the Alaska Statewide Harvest Survey (Jennings et al. 2006a-b).

#### 2004

In 2004, a direct expansion onsite two-stage stratified creel survey was conducted at four access locations (Crooked Creek State Recreation Site, Cohoe Cove, Kasilof Cabins, and Trujillo's Landing). Each access location represented one level of stratification for the survey. At each location, except Trujillo's Landing, the entire early-run season was treated as a separate sampling stratum; whereas, the first Sunday (May 16) and all days thereafter at Trujillo's Landing were treated as separate sampling strata. Treatment of Sunday (May 16) at Trujillo's Landing as its own separate sampling stratum was required due to the following reasons: (1) the vast majority of anglers participating in the fishery exit at Trujillo's Landing; and (2) May 16 occurred on a weekend day and by regulation it was the first day in which bait fishing was allowed, likely leading to a substantial number of anglers exiting the fishery at this location<sup>3</sup>.

Sample days at each location represented the first-stage sampling units in this two-stage sampling design. Days were selected systematically within each sampling stratum with more than 1 day per stratum. For any selected day within a stratum the entire day was sampled. The number of days to sample within each stratum was set to approximate the relative differences in use by anglers, according to expectations and experience while conducting similar surveys in the past. The days to sample at Trujillo's Landing after May 16 were selected by an unconstrained random systematic manner; that is, one of the first 3 days (May 17–19) was selected at random for sampling, and then every third day following this first selection was selected systematically for sampling. Conversely, days to sample at the Crooked Creek State Recreation Site, Cohoe Cove, and Kasilof Cabins were constrained by the days selected for sampling for the prior stratum, as follows:

1. Crooked Creek State Recreation Site: The first day selected for sampling followed the first day selected for sampling at Trujillo's Landing. Every 6th day thereafter was selected systematically for sampling.

<sup>&</sup>lt;sup>3</sup> Opportunities for freshwater angling for Chinook salmon in other Kenai Peninsula streams are limited in May, and no other fishery in the area allows fishing with bait.

- 2. Cohoe Cove: A random selection between Cohoe Cove and Kasilof Cabins designated Cohoe Cove as the next site in the sampling design. The first day selected for sampling followed the first day selected for sampling at Crooked Creek State Recreation Site. Every 12th day thereafter was selected systematically for sampling.
- 3. Kasilof Cabins: The first day selected for sampling followed the second day for sampling at Crooked Creek State Recreation Site. Every 12th day thereafter was selected systematically for sampling.

Constrained sampling of these locations was necessitated by logistical considerations (i.e., only two creel technicians were available to sample, meaning only one stratum could be sampled on any selected day). The 14-hour sampling day occurred between the hours of 0800 to 2159. Each creel technician worked one-half of the sampling day at the selected location, and as such the entire day was sampled (i.e., there were no subsamples of periods within the day).

Within each sampled day individual anglers represented the second-stage sampling units in this two-stage design. During each sampled day within a stratum, creel technicians attempted to interview all exiting anglers. Data collected from each angler included: time of day, access location, guided/unguided angler type or boat/shore angler type number of hours fished; finclip marking status, sex, scale sample, and length for harvested fish and the number of Chinook salmon caught and released. Some anecdotal information on catch and harvest of non-target species was also noted.

In 2004, the creel survey was a stratified two-stage (days/angler trips) design. Estimates of catch, effort, and harvest were calculated using equation 2.1 in Bernard et al. (1998), Table 2.1, page 20; variances followed equation 2.5 in Bernard et al. (1998), Table 2.4, page 24 using the systematic sampling form of the equation.

"Relative imprecision" (RIXX, as defined below) was calculated as a shorthand way to gauge the achievement of project precision goals. RIXX for the abundance estimates is the half-width of the XX% confidence interval divided by the point estimate. Thus, the RI95 of the estimate of quantity y is

$$RI95(\hat{y}) = 1.96 \frac{\sqrt{V(\hat{y})}}{\hat{y}},\tag{1}$$

where 1.96 is the critical value of the standard normal distribution used to construct a 95% confidence interval with 0.025 probability in each tail. The corresponding critical value for a 90% interval is 1.645.

#### 2005-2008

A direct expansion onsite three-stage stratified creel survey was conducted at the Crooked Creek State Recreation Site (CCSRS), Cohoe Cove, Kasilof Cabins, and Trujillo's Landing access locations from 2005 through 2008. Sampling stage units were days, shift location combinations within days, and angler trips within shifts. The creel surveys were stratified by day of the week, access location, and time of day.

Tuesdays and Saturdays comprised a separate stratum (TS) in order to facilitate the primary objective of estimating the harvest of naturally-produced fish. All Tuesdays and Saturdays were sampled. Trujillo's Landing and CCSRS access locations had greater naturally-produced fish

catches than Cohoe Cove and Kasilof Cabins during previous surveys. Therefore, the Tuesday/Saturday stratum was further subdivided into two geographic strata, based on level of catch (TS Hi and TS Lo). Stratum TS Lo (Cohoe Cove and Kasilof Cabins) was sampled on the first Tuesday (May 16) of the season, and every third Tuesday or Saturday thereafter. During all remaining Tuesdays and Saturdays, stratum TS Hi (Trujillo's Landing and CCRS) was sampled. Each sampling day had two possible shifts, 0800–1500 (early) and 1500–2200 (late). Within each geographic stratum, two of the possible four combinations of location and shift were selected at random for sampling (stage two sampling fraction = 0.5).

The remaining 5 days of the week (e.g., Sunday, Monday, Wednesday, Thursday, and Friday [SMWRF]) were sub-sampled: 3 of the 5 days were selected at random for sampling. Hatcheryfish harvest in previous years was substantially greater at Trujillo's during the morning shift than during any other location/shift combination; therefore it comprised its own stratum (SMWRF Hi). The late shift at Kasilof Cabins was excluded from SMWRF sampling<sup>4</sup>. All other location/shift combinations comprised the second SMWRF stratum (SMWRF Lo; Cohoe Cove early and late, CCSRS early and late, Kasilof Cabins early, and Trujillo's Landing late). On SMWRF sample days, SMWRF Hi (Trujillo's Landing early shift) was always sampled (stage two sampling fraction = 1.0). The other sampling period for that day was selected randomly from the remaining six combinations of location/shift (SMWRF Lo stage two sampling fraction = 0.17)<sup>5</sup>.

In 2006 and 2007 by emergency order and in 2008 by regulation, an additional day (Thursday) was added to harvest naturally-produced Chinook salmon. Subsequently, Thursdays were moved from the SMWRF stratum to the TS stratum, with the respective sampling designs remaining essentially unchanged. However, stratum TS Lo was sampled every 4th Tuesday, Thursday, or Saturday thereafter and stratum TS Hi was sampled all remaining Tuesdays, Thursdays, and Saturdays. Finally, 2 of 4 days selected at random were sampled from SMWF strata.

In 2005–2008, the creel survey was a stratified three-stage (days/shifts/angler trips) design. Estimates of catch, effort, and harvest were calculated using equation 2.2 in Bernard et al. (1998), Table 2.1, page 20; variances followed equation 2.6 in Bernard et al. (1998), Table 2.4, page 24 using the systematic sampling form of the equation. In some strata (SMWRF Lo), stage-2 variances were not estimable because only one shift was sampled per stage-1 unit. As a result, the variance estimates are biased slightly low for these strata. Interviews were conducted in 2005–2008 in the same manner as in 2004. Precision estimates for 2005 through 2008 were calculated in the same manner as in 2004.

#### AGE, SEX, AND LENGTH

Harvested Chinook salmon were sampled for age, sex, and length (ASL) during angler interviews during all years of the creel survey. Sex was identified from external morphologic characteristics. AFC status was determined by the presence or absence of an adipose finclip and the mid eye to fork (MEF) length was measured to the nearest millimeter. Three scales were removed from the right side of the fish approximately two rows above the lateral line along a diagonal line downward from the posterior insertion of the dorsal fin to the anterior insertion of

<sup>&</sup>lt;sup>4</sup> Previous experience indicated that there was negligible angling effort at Kasilof Cabins during the late shift on those days.

<sup>&</sup>lt;sup>5</sup> As a result, it was not possible to directly estimate the second-stage component of sampling error for the SMWRF Lo stratum.

the anal fin and placed on an adhesive coated card (Clutter and Whitesel 1956, Welander 1940). Acetate impressions of the scales were aged by trained personnel using a microfiche reader (Olsen 1992).

In 2002 and 2003 every Chinook salmon encountered was sampled. During the 2004 creel survey, every harvested Chinook salmon encountered was sampled. In 2005, every naturally-produced Chinook salmon encountered was sampled, as was *every other* hatchery-produced Chinook salmon. In 2006, every naturally-produced and every 5th hatchery-produced Chinook salmon was sampled. In 2007 and 2008, for simplicity, every 3rd Chinook salmon encountered, regardless of marking status, was sampled for ASL information.

Sex and age composition were estimated separately for naturally- and hatchery-produced fish.

For 2003–2008, the proportion of adult Chinook salmon<sup>6</sup> in the early-run of age/sex class j was estimated as:

$$\hat{p}_j = \frac{n_j}{n_i} \tag{2}$$

where:

 $n_j$  = the number of adult Chinook salmon of age/sex class j, and

 $n_i$  = the total number of adult Chinook salmon scale samples that could be aged.

The variance of age/sex class *j* was estimated (Cochran 1977) by:

$$\hat{V}(\hat{p}_{j}) = \frac{\hat{p}_{j}(1-\hat{p}_{j})}{n-1}.$$
(3)

Relative imprecision (RIXX) for the proportion estimates was calculated in the same manner as shown in the methods for effort, catch, and harvest.

#### RESULTS

#### **EFFORT, CATCH, AND HARVEST**

#### 2002

The 2002 harvest monitoring program was conducted from June 12 to June 30 with 17 of the 19 (89.5%) days being sampled. Of those sampled days, 41.2% had two shifts daily. A total of 326 interviews were conducted: 257 boat anglers and 69 shorebased anglers (Table 1).

The 2002 harvest sampling program only operated for 2 days during which the sport fishery was open to the harvest of naturally-produced Chinook salmon. Due to this non-representative sample and incomplete marking of hatchery-produced Chinook salmon, we were unable to generate estimates for the naturally- and hatchery-produced contribution to the harvest.

Estimates by angler type or method during 2002 could not be generated from the limited creel survey dataset. However, the Alaska Statewide Harvest Survey (SWHS) estimated early-run Chinook salmon harvest to be 2,483 (SE = 279) for guided anglers and 2,308 (SE = 262) for

<sup>&</sup>lt;sup>6</sup> Estimates of age and sex composition were not temporally stratified because the corresponding estimates of harvest and their variances were not well-suited for such stratification.

	Number of creel survey interviews conducted by category											
-		Combined total										
	Boat	Shore	(boat plus	Guided	Unguided	(guided plus						
Year	anglers	anglers	shore anglers)	anglers	anglers	unguided anglers)						
2002	257	69	326	247	79	326						
2003	2,708	276	2,984	2,393	591	2,984						
2004	1,574	994	2,568	1,158	1,410	2,568						
2005	2,046	1,234	3,280	1,485	1,795	3,280						
2006	2,178	1,498	3,676	1,584	2,092	3,676						
2007	1,976	1,511	3,487	1,452	2,035	3,487						
2008	1,696	1,663	3,359	1,258	2,101	3,359						

Table 1.-Kasilof River early-run Chinook salmon creel survey sampling summary, 2002–2008.

unguided anglers (Kathrin Sundet, ADF&G research analyst, Anchorage Alaska, personal communication). The SWHS harvest estimates by method were 2,980 (SE = 288) for boat anglers, 1,754 (SE = 243) for shore anglers and 57 (SE = 46) for unknown angler type (Kathrin Sundet, ADF&G research analyst, Anchorage, Alaska, personal communication).

#### 2003

The 2003 harvest monitoring program was conducted from May 16 to June 30 and sampled every day of the 46-day sport fishery. Over half of the creel survey (54.3%) was conducted with two shifts daily. A total of 2,984 interviews were conducted: 2,708 boat anglers and 276 shore anglers (Table 1). There was no harvest of naturally-produced Chinook salmon because sport fishing regulations prohibited their retention.

The data collected during the 2003 creel survey was again limited to age, sex and length. Due to the sampling design, estimates by angler type or method during 2003 could not be generated from the creel survey. However, the SWHS estimated early-run Chinook salmon harvest to be 1,380 (SE = 195) for guided harvest and 1,710 (SE = 192) for unguided harvest (Kathrin Sundet, ADF&G research analyst, Anchorage, Alaska, personal communication). Jennings et al. 2006bThe SWHS harvest estimates by method were 1,798 (SE = 214) for boat anglers, 1,269 (SE = 179) for shore anglers and 23 (SE = 16) for an unknown angler type (Kathrin Sundet, ADF&G research analyst, Anchorage, Alaska, personal communication).

#### 2004

The 2004 creel survey was conducted 5 days per week from May 16 to June 30. The creel survey sampled 32 days (69.6%) of the sport fishery with all sample days comprised of an earlyand late-shift. A total of 2,568 interviews were conducted: 1,574 boat anglers and 994 shore anglers (Table 1).

The early-run Chinook salmon creel survey estimated the harvest of hatchery-produced Chinook salmon to be 2,407 (SE = 271) (Table 2). There was no harvest of naturally-produced Chinook salmon because sport fishing regulations prohibited their retention. Guided anglers accounted for 61.4% of the Kasilof River early-run hatchery-produced Chinook salmon harvest compared to 38.6% for unguided anglers. Boat anglers accounted for 79.1% of the hatchery-produced Chinook salmon harvest compared to 20.9% for shore anglers. The estimated catch of both

	Creel survey estimates											
	Naturally-produced		Hatchery	-produced	Combined total <sup>a</sup>							
	Chinook	salmon	Chinool	salmon	(naturally- plus hatc	hery-produced)	Eff	ort				
Category	Catch	Harvest <sup>b</sup>	Catch	Harvest	Catch	Harvest	Angler-hours	No. of anglers				
Angler type/method subtota	ls											
Guided shore (SE)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)				
Percentage	0.0%	NA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%				
Guided boat (SE)	1,687 (159)	0 (0)	1,776 (170)	1,479 (143)	3,463 (284)	1,479 (143)	24,670 (2,113)	4,328 (330)				
Percentage	55.8%	NA	57.9%	61.4%	56.9%	61.4%	47.6%	36.0%				
Unguided shore (SE)	828 (139)	0 (0)	815 (176)	503 (91)	1,643 (313)	503 (91)	15,096 (1,656)	5,138 (541)				
Percentage	27.4%	NA	26.6%	20.9%	27.0%	20.9%	29.1%	42.8%				
Unguided boat (SE)	509 (176)	0 (0)	475 (154)	426 (152)	983 (325)	426 (152)	12,089 (4,789)	2,550 (911)				
Percentage	16.8%	NA	15.5%	17.7%	16.1%	17.7%	23.3%	21.2%				
Angler type subtotals												
Guided (SE)	1,687 (159)	0 (0)	1,776 (170)	1,479 (143)	3,463 (284)	1,479 (143)	24,670 (2,113)	4,328 (330)				
Percentage	55.8%	NA	57.9%	61.4%	56.9%	61.4%	47.6%	36.0%				
Unguided (SE)	1,337 (224)	0 (0)	1,290 (242)	929 (187)	2,626 (187)	929 (187)	27,185 (5,112)	7,688 (1,095)				
Percentage	44.2%	NA	42.1%	38.6%	43.1%	38.6%	52.4%	64.0%				
Method subtotals												
Shore (SE)	828 (139)	0 (0)	815 (176)	503 (91)	1,643 (313)	503 (91)	15,096 (1,656)	5,138 (541)				
Percentage	27.4%	NA	26.6%	20.9%	27.0%	20.9%	29.1%	42.8%				
Boat (SE)	2,195 (266)	0 (0)	2,251 (268)	1,904 (245)	4,446 (498)	1,904 (245)	36,759 (6,128)	6,878 (1,083)				
Percentage	72.6%	NA	73.4%	79.1%	73.0%	79.1%	70.9%	57.2%				
Total (SE) <sup>a</sup>	3,023 (300)	0(0)	3,066 (329)	2,407 (271)	6,089 (596)	2,407 (271)	51,854 (6,370)	12,015 (1,235)				

Table 2.-Creel survey estimates of Kasilof River early-run Chinook salmon catch, harvest, and effort by angler category and method, May 16 through June 30, 2004.

<sup>a</sup> Subtotals may not sum due to rounding errors.
 <sup>b</sup> Sport harvest of naturally-produced Chinook salmon prohibited by regulation.

naturally- and hatchery-produced Chinook salmon was 6,089 (SE = 596), indicating 60.5% of the fish caught were released. The total estimated effort was 51,854 (SE = 6,370) angler-hours with 12,015 (SE = 1,235) anglers participating in the sport fishery.

The estimate of the total harvest for naturally-produced and hatchery-produced Chinook salmon did not satisfy the project precision objective (realized RI95 = 0.22 vs. objective RI95 = 0.15). The project objectives were likely not met since this was the first year of the standardized creel survey.

#### 2005

The 2005 creel survey was conducted 5 days per week from May 16 to June 30. The creel survey sampled 33 days (71.7%) of the sport fishery and a total of 3,280 interviews were conducted: 2,046 boat anglers and 1,234 shore anglers (Table 1).

The early-run Chinook salmon creel survey estimated total harvest to be 2,665 fish (SE = 272) (Table 3). The estimated harvest of naturally-produced Chinook salmon was 572 (SE = 79) and hatchery-produced Chinook salmon was 2,093 (SE = 238). Guided anglers accounted for 66.3% of the Kasilof River early-run Chinook salmon harvest compared to 33.7% for unguided anglers. Boat anglers accounted for 81.4% of the harvest compared to 18.6% for shore anglers. The estimated catch of both naturally- and hatchery-produced Chinook salmon was 5,555 (SE = 648), indicating 52.0% of the fish caught were released. The total estimated effort was 60,592 (SE = 6,958) angler-hours with 12,053 (SE = 1,512) anglers participating in the sport fishery.

The estimate of the catch and harvest of naturally-produced Chinook salmon did not satisfy the project precision objective (realized RI95 = 0.28 catch and RI95 = 0.27 harvest, vs. objective RI95 = 0.25), however estimates of the catch and harvest of hatchery-produced Chinook salmon did satisfy the project precision objective (realized RI95 = 0.20 catch and RI95 = 0.22 harvest, vs. objective RI95 = 0.25). The objectives for naturally-produced Chinook salmon were likely not met since this was the first year of liberalized sport fishing regulations for naturally-produced Chinook salmon and possibly because anglers were unaware of the regulatory changes.

#### 2006

The 2006 creel survey was conducted 5 days per week from May 16 to June 30. The creel survey sampled 35 days (76.1%) of the sport fishery and a total of 3,676 interviews were conducted: 2,178 boat anglers and 1,498 shore anglers (Table 1).

The early-run Chinook salmon creel survey estimated the total harvest to be 2,489 fish (SE = 200) (Table 4). The estimated harvest of naturally-produced Chinook salmon was 1,057 fish (SE = 96) and hatchery-produced Chinook salmon was 1,432 fish (SE = 140). Guided anglers accounted for 73.0% of the Kasilof River early-run Chinook salmon harvest compared to 27.0% for unguided anglers. Boat anglers accounted for 88.1% of the harvest compared to 11.9% for shore anglers. The estimated catch of both naturally- and hatchery-produced Chinook salmon was 4,771 (SE = 379), indicating 47.8% of the fish were released. The total estimated effort was 75,258 (SE = 5,763) angler-hours with 16,428 (SE = 1,660) anglers participating in the sport fishery.

Estimates of the catch and harvest of naturally-produced Chinook salmon satisfied the project precision objective (realized RI95 = 0.15 catch and RI95 = 0.18 harvest, vs. objective RI95 = 0.30).

				(	Creel survey estimates			
	Naturally-produced		Hatchery-	produced	Combined total <sup>a</sup>			
	Chinook	salmon	Chinook	salmon	(naturally-plus hatc	hery-produced)	Eff	ort
Category	Catch	Harvest	Catch	Harvest	Catch <sup>b</sup>	Harvest	Angler-hours	No. of anglers
Angler type/method subtotal	ls							
Guided shore (SE)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Percentage	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Guided boat (SE)	1,871 (294)	303 (69)	1,574 (251)	1,465 (238)	3,446 (525)	1,768 (272)	32,840 (5,360)	4,615 (632)
Percentage	63.0%	53.0%	63.6%	70.0%	62.0%	66.3%	54.2%	38.3%
Unguided shore (SE)	697 (258)	174 (71)	567 (163)	322 (98)	1,366 (432)	497 (151)	16,452 (4,673)	5,142 (1,479)
Percentage	23.5%	30.4%	22.9%	15.4%	24.6%	18.6%	27.2%	42.7%
Unguided boat (SE)	402 (80)	95 (23)	334 (92)	306 (91)	743 (136)	401 (104)	11,300 (1,722)	2,297 (412)
Percentage	13.5%	16.6%	13.5%	14.6%	13.4%	15.0%	18.6%	19.1%
Angler type subtotals								
Guided (SE)	1,871 (294)	303 (69)	1,574 (251)	1,465 (238)	3,446 (525)	1,768 (272)	32,840 (5,360)	4,615 (632)
Percentage	63.0%	52.9%	63.6%	70.0%	62.0%	66.3%	54.2%	38.3%
Unguided (SE)	1,099 (267)	270 (71)	901 (183)	628 (134)	2,109 (445)	898 (181)	27,752 (4,753)	7,438 (1,480)
Percentage	37.0%	47.1%	36.4%	30.0%	38.0%	33.7%	45.8%	61.7%
Method subtotals								
Shore (SE)	697 (285)	174 (71)	567 (163)	322 (98)	1,366 (432)	497 (151)	16,452 (4,673)	5,142 (1,479)
Percentage	23.5%	30.4%	22.9%	15.4%	24.6%	18.6%	27.2%	42.7%
Boat (SE)	2,273 (367)	398 (75)	1,909 (266)	1,771 (250)	4,189 (602)	2,169 (283)	44,140 (6,188)	6,911 (845)
Percentage	76.5%	69.6%	77.1%	84.6%	75.4%	81.4%	72.8%	57.3%
Total (SE) <sup>a</sup>	2,971 (418)	572 (79)	2,476 (258)	2,093 (238)	5,555 (648)	2,665 (272)	60,592 (6,958)	12,053 (1,521)

Table 3.-Creel survey estimates of Kasilof River early-run Chinook salmon catch, harvest, and effort by angler category and method, May 16 through June 30, 2005.

<sup>a</sup> Subtotals may not sum due to rounding errors.
<sup>b</sup> Naturally- and hatchery-produced total does not sum due to unknown hatchery status.

				C	Creel survey estimates			
	Naturally-produced		Hatchery-	produced	Combined	Combined total <sup>a</sup>		
	Chinook	salmon	Chinook	salmon	(naturally-plus hatc	hery-produced)	Eff	ort
Category	Catch	Harvest	Catch	Harvest	Catch <sup>b</sup>	Harvest	Angler-hours	No. of anglers
Angler type/method subtotal	ls							
Guided shore (SE)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Percentage	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Guided boat (SE)	2,070 (210)	738 (93)	1,199 (161)	1,080 (140)	3,330 (366)	1,818 (198)	38,065 (3,145)	5,410 (448)
Percentage	68.9%	69.8%	72.2%	75.4%	69.8%	73.0%	50.6%	33.3%
Unguided shore (SE)	573 (133)	128 (37)	271 (52)	168 (36)	887 (190)	296 (64)	23,199 (4,512)	7,910 (1,510)
Percentage	19.1%	12.1%	16.3%	11.7%	18.6%	11.9%	30.8%	48.7%
Unguided boat (SE)	363 (49)	192 (30)	191 (32)	184 (31)	553 (69)	375 (49)	13,994 (2,566)	2,928 (609)
Percentage	12.1%	18.2%	11.5%	12.8%	11.6%	15.1%	18.6%	18.0%
Angler type subtotals								
Guided (SE)	2,070 (210)	738 (93)	1,199 (161)	1,080 (140)	3,330 (366)	1,818 (198)	38,065 (3,145)	5,410 (448)
Percentage	68.9%	69.8%	72.2%	75.4%	69.8%	73.0%	50.6%	33.3%
Unguided (SE)	936 (133)	320 (42)	462 (57)	352 (45)	1,440 (190)	672 (71)	37,193 (5,416)	10,838 (1,706)
Percentage	31.1%	30.2%	27.8%	24.6%	30.2%	27.0%	49.4%	66.7%
Method subtotals								
Shore (SE)	573 (133)	128 (37)	271 (52)	168 (36)	887 (190)	296 (64)	23,199 (4,512)	7,910 (1,510)
Percentage	19.1%	12.1%	16.3%	11.7%	18.6%	11.9%	30.8%	48.7%
Boat (SE)	2,433 (228)	929 (110)	1,390 (167)	1,264 (145)	3,884 (388)	2,193 (219)	52,059 (4,373)	8,338 (779)
Percentage	80.9%	87.9%	83.7%	88.3%	81.4%	88.1%	69.2%	51.3%
Total (SE) <sup>a</sup>	3,006 (228)	1,057 (96)	1,661 (159)	1,432 (140)	4,771 (379)	2,489 (200)	75,258 (5,763)	16,248 (1,660)

Table 4.-Creel survey estimates of Kasilof River early-run Chinook salmon catch, harvest, and effort by angler category and method, May 16 through June 30, 2006.

<sup>a</sup> Subtotals may not sum due to rounding errors.
<sup>b</sup> Naturally- and hatchery-produced total does not sum due to unknown hatchery status.

#### 2007

The 2007 creel survey was conducted 5 days per week from May 16 to June 30. The creel survey sampled 35 days (76.1%) of the sport fishery and a total of 3,487 interviews were conducted: 1,976 boat anglers and 1,511 shore anglers (Table 1).

The early-run Chinook salmon creel survey estimated the total harvest to be 2,654 fish (SE = 340) (Table 5). The estimated harvest of naturally-produced Chinook salmon was 1,107 fish (SE = 170) and hatchery-produced Chinook salmon was 1,547 fish (SE = 196). Guided anglers accounted for 73.1% of the Kasilof River early-run Chinook salmon harvest compared to 26.9% for unguided anglers. Boat anglers accounted for 87.6% of the harvest compared to 12.4% for shore anglers. The estimated catch of both naturally- and hatchery-produced Chinook salmon was 4,426 (SE = 456), indicating 40.0% of the fish were released. The total estimated effort was 61,243 (SE = 5,194) angler-hours with 12,915 (SE = 1,231) anglers participating in the fishery.

The estimate of the catch and harvest of naturally-produced Chinook salmon satisfied the project precision objective (realized RI95 = 0.20 catch and RI95 = 0.30 harvest, vs. objective RI95 = 0.30).

#### 2008

The 2008 creel survey was conducted 5 days per week from May 16 to June 30. The creel survey sampled 34 days (73.9%) of the sport fishery and a total of 3,359 interviews were conducted: 1,696 boat anglers and 1,663 shore anglers (Table 1).

The early-run Chinook salmon creel survey estimated the total harvest to be 1,984 fish (SE = 305) (Table 6). The estimated harvest of naturally-produced Chinook salmon was 832 fish (SE = 165) and hatchery-produced Chinook salmon was 1,129 fish (SE = 193)<sup>7</sup>. Guided anglers accounted for 75.8% of the Kasilof River early-run Chinook salmon harvest compared to 24.2% for unguided anglers. Boat anglers accounted for 85.5% of the harvest compared to 14.5% for shore anglers. The estimated catch of both naturally- and hatchery-produced Chinook salmon was 3,184 (SE = 402), indicating 37.7% of the fish were released. The total estimated effort was 61,813 (SE = 3,877) angler-hours with 13,313 (SE = 790) anglers participating in the fishery.

The estimate of the harvest of naturally-produced Chinook salmon did not satisfy the project precision objective (realized RI95 = 0.39, vs. objective RI95 = 0.30). The project objective was probably not met due to a small return, resulting in lower catch and harvest in the fishery.

### AGE, SEX, AND LENGTH

#### 2002

The 2002 Kasilof River early-run Chinook salmon sport harvest was composed of both naturallyand hatchery-produced fish until June 14 when ADF&G issued an emergency order prohibiting the retention of naturally-produced Chinook salmon. Creel survey technicians collected ASL information from 297 Chinook salmon during the sampling period (June 12 through June 30). Harvest of salmon without an adipose finclip (non-AFC) was only allowed for the first 2 days of the harvest monitoring program. Of the 297 fish, 169 were non-AFC and 128 had an adipose finclip (AFC) and were hatchery-produced.

<sup>&</sup>lt;sup>7</sup> The total does not sum because there was a small amount of fish with unknown hatchery status reported during the creel survey.

				C	Freel survey estimates			
	Naturally-produced		Hatchery-	produced	Combined total <sup>a</sup>			
	Chinook	salmon	Chinook	salmon	(naturally-plus hatc	hery-produced)	Eff	fort
Category	Catch	Harvest	Catch	Harvest	Catch <sup>b</sup>	Harvest	Angler-hours	No. of anglers
Angler type/method subtotals	S							
Guided shore (SE)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Percentage	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Guided boat (SE)	1,774 (228)	744 (141)	1,324 (208)	1,196 (182)	3,162 (427)	1,940 (293)	32,363 (3,400)	4,625 (462)
Percentage	71.3%	67.2%	73.1%	77.3%	71.4%	73.1%	52.8%	35.8%
Unguided shore (SE)	444 (119)	171 (42)	256 (66)	158 (42)	747 (193)	329 (73)	17,953 (3,537)	6,181 (1,230)
Percentage	17.8%	15.4%	14.1%	10.2%	16.9%	12.4%	29.3%	47.9%
Unguided boat (SE)	270 (66)	192 (62)	230 (45)	192 (39)	516 (100)	384 (86)	10,926 (3,209)	2,109 (600)
Percentage	10.9%	17.3%	12.7%	12.4%	11.7%	14.5%	17.8%	16.3%
Angler type subtotals								
Guided (SE)	1,774 (228)	744 (141)	1,324 (208)	1,196 (182)	3,162 (247)	1,940 (293)	32,363 (3,400)	4,625 (462)
Percentage	71.3%	67.2%	73.1%	77.3%	71.5%	73.1%	52.8%	35.8%
Unguided (SE)	714 (135)	363 (74)	486 (71)	351 (54)	1,263 (206)	713 (112)	28,879 (4,767)	8,290 (1,356)
Percentage	28.7%	32.8%	26.9%	22.7%	28.5%	26.9%	47.2%	64.2%
Method subtotals								
Shore (SE)	444 (119)	171 (42)	256 (66)	158 (42)	747 (193)	329 (73)	17,953 (3,537)	6,181 (1,230)
Percentage	17.8%	15.4%	14.1%	10.2%	16.9%	12.4%	29.3%	47.9%
Boat (SE)	2,044 (267)	936 (182)	1,554 (236)	1,389 (204)	3,678 (499)	2,325 (357)	43,290 (5,437)	6,734 (871)
Percentage	82.2%	84.6%	85.9%	89.8%	83.1%	87.6%	70.7%	52.1%
Total (SE) <sup>a</sup>	2,488 (249)	1,107 (170)	1,810 (223)	1,547 (196)	4,426 (456)	2,654 (340)	61,243 (5,194)	12,915 (1,231)

Table 5.-Creel survey estimates of Kasilof River early-run Chinook salmon catch, harvest, and effort by angler category and method, May 16 through June 30, 2007.

<sup>a</sup> Subtotals may not sum due to rounding errors.
<sup>b</sup> Naturally- and hatchery-produced total does not sum due to unknown hatchery status.

				C	Freel survey estimates			
	Naturally-J	produced	Hatchery-	produced	Combined	total <sup>a</sup>		
	Chinook	salmon	Chinook	salmon	(naturally-plus hatc	hery-produced)	Eff	fort
Category	Catch	Harvest	Catch	Harvest	Catch <sup>b</sup>	Harvest <sup>b</sup>	Angler-hours	No. of anglers
Angler type/method subtotal	ls							
Guided shore (SE)	5 (4)	5 (4)	8 (4)	8 (4)	14 (7)	14 (7)	248 (110)	57 (25)
Percentage	0.3%	0.6%	0.7%	0.7%	0.4%	0.7%	0.4%	0.4%
Guided boat (SE)	1,344 (220)	558 (146)	936 (203)	910 (195)	2,303 (399)	1,490 (297)	31,113 (3,821)	4,420 (516)
Percentage	70.7%	67.1%	76.6%	80.6%	72.3%	75.1%	50.3%	33.2%
Unguided shore (SE)	353 (52)	163 (30)	173 (34)	111 (19)	564 (90)	274 (46)	19,712 (2,451)	6,511 (830)
Percentage	18.6%	19.6%	14.2%	9.8%	17.7%	13.8%	31.9%	48.9%
Unguided boat (SE)	200 (61)	106 (53)	104 (22)	100 (22)	304 (70)	207 (55)	10,740 (1,674)	2,325 (376)
Percentage	10.5%	12.7%	8.5%	8.9%	9.5%	10.4%	17.4%	17.5%
Angler type subtotals								
Guided (SE)	1,349 (219)	563 (145)	944 (202)	918 (194)	2,316 (398)	1,503 (296)	31,361 (3,799)	4,477 (511)
Percentage	70.9%	67.7%	77.3%	81.2%	72.7%	75.8%	50.7%	33.6%
Unguided (SE)	553 (79)	269 (60)	277 (39)	212 (28)	868 (111)	481 (69)	30,452 (2,755)	8,836 (849)
Percentage	29.1%	32.3%	22.7%	18.8%	27.3%	24.2%	49.3%	66.4%
Method subtotals								
Shore (SE)	358 (52)	168 (30)	182 (35)	119 (21)	578 (91)	288 (49)	19,960 (2,470)	6,568 (834)
Percentage	18.8%	20.2%	14.9%	10.5%	18.1%	14.5%	32.3%	49.3%
Boat (SE)	1,544 (242)	664 (174)	1,040 (204)	1,010 (196)	2,607 (417)	1,697 (319)	41,853 (4,545)	6,744 (725)
Percentage	81.2%	79.8%	85.1%	89.5%	81.9%	85.5%	67.7%	50.7%
Total (SE) <sup>a</sup>	1,902 (231)	832 (165)	1,222 (202)	1,129 (193)	3,184 (402)	1,984 (305) <sup>b</sup>	61,813 (3,877)	13,313 (790)

Table 6.-Creel survey estimates of Kasilof River early-run Chinook salmon catch, harvest, and effort by angler category and method, May 16 through June 30, 2008.

<sup>a</sup> Subtotals may not sum due to rounding errors.
 <sup>b</sup> Naturally- and hatchery-produced total does not sum due to unknown hatchery status.

During the 2 days non-AFC Chinook salmon were harvested, the age composition was 13.0% (SE = 2.6%) ocean-age-2, 75.1% (SE = 3.3%) ocean-age-3, and 11.8% (SE = 2.5%) ocean-age-4 fish (Appendix A1). The sex composition of the harvest was 55.6% females and 44.4% males (SE = 3.8%). Mean length of non-AFC fish sampled was 763 mm (SE = 6) where males measured 752 mm (SE = 10) and females measured 771 mm (SE = 7). The age composition of AFC fish sampled in the harvest was 49.2% (SE = 4.4%) ocean-age-2, 48.4% (SE = 4.4%) ocean-age-3, and 2.3% (SE = 1.3%) ocean-age-4 fish. The sex composition of the harvest was 56.3% females and 43.8% males (SE = 4.4%). Mean length of sampled AFC fish was 684 mm (SE = 7), where males measured 657 mm (SE = 10) and females measured 705 mm (SE = 8).

#### 2003

Only hatchery-produced Chinook salmon were harvested during the 2003 Kasilof River earlyrun Chinook salmon sport fishery. The SWHS estimate of early-run Chinook salmon harvest was used to generate estimates by age because the creel survey sampling design did not permit harvest estimates (Kathrin Sundet, ADF&G research analyst, Anchorage, Alaska, personal communication). We did not correct for the unmarked fraction of ocean-age-4 hatcheryproduced fish because there were so few in the sample. Creel survey technicians collected ASL information from 602 Chinook salmon during the sampling period. The age composition from the harvest was 34.7% (SE = 1.9%) ocean-age-2, 64.6% (SE = 2.0%) ocean-age-3, and 0.7% (SE = 0.3%) ocean-age-4 fish (Table 7). The sex composition of the harvest was 53.7% females and 46.3% males (SE = 2.0%). Mean length of all fish sampled was 727 mm (SE = 3), where males measured 700 mm (SE = 5) and females measured 750 mm (SE = 4).

All estimates of age and sex of naturally- and hatchery-produced Chinook salmon satisfied the project precision objective (RI95 = 0.05).

#### 2004

Only hatchery-produced Chinook salmon were harvested during the 2004 Kasilof River earlyrun Chinook salmon sport fishery. Creel survey technicians collected ASL information from 581 Chinook salmon during the sampling period. The age composition from the harvest was 38.6% (SE = 2.0%) ocean-age-2, 57.3% (SE = 2.1%) ocean-age-3, and 4.1% (SE = 0.8%) ocean-age-4 fish (Table 8). The sex composition of the harvest was 59.4% females and 40.6% males (SE = 2.0%). Mean length of all fish sampled was 761 mm (SE = 6), where males measured 688 mm (SE = 5) and females measured 735 mm (SE = 3).

All estimates of age and sex of naturally- and hatchery-produced Chinook salmon satisfied the project precision objective (RI95 = 0.06).

#### 2005

Both naturally- and hatchery-produced fish were harvested during the 2005 Kasilof River earlyrun Chinook salmon sport fishery. Creel survey technicians collected ASL information from 437 Chinook salmon during the sampling period. The age composition from the total harvest was 19.5% (SE = 1.9%) ocean-age-2, 78.0% (SE = 2.0%) ocean-age-3, and 2.5% (SE = 0.8%) oceanage-4 fish (Table 9). The sex composition of the total harvest was 56.1% females and 43.9% males (SE = 2.4%). Mean length of all fish sampled was 767 mm (SE = 3), where males measured 763 mm (SE = 6) and females measured 772 mm (SE = 4).

		Ocean-age <sup>a</sup>		
Parameter	2	3	4 <sup>b</sup>	Total <sup>a</sup>
Hatchery-produced <sup>c</sup>				
Female $(N)$	57	263	3	323
% (SE)	9.5% (1.2%)	43.7% (2.0%)	0.5% (0.3%)	53.7% (2.0%)
Harvest estimate (SE)	293 (45)	1,350 (137)	15 (9)	1,658 (162)
Mean MEF length (SE)	645 (6)	771 (2)	894 (48)	750 (4)
MEF length range	554-719	640-884	804-967	554-967
Male $(N)$	152	126	1	279
% (SE)	25.2% (1.8%)	20.9% (1.7%)	0.2% (0.2%)	46.3% (2.0%)
Harvest estimate (SE)	780 (89)	647 (78)	5 (5)	1,432 (144)
Mean MEF length (SE)	639 (4)	773 (4)	925 (0)	700 (5)
MEF length range	524-734	643-884	925-925	524-925
Male & female combined $(N)$	209	389	4	602
% (SE)	34.7% (1.9%)	64.6% (2.0%)	0.7% (0.3%)	100.0% (0.0%)
Harvest estimate (SE)	1,073 (114)	1,997 (190)	21 (10)	3,090 (279) <sup>d</sup>
Mean MEF length (SE)	641 (3)	772 (2)	902 (35)	727 (3)
MEF length range	524-734	640-884	804-967	524-967

Table 7.-Creel survey estimates of harvest and length of hatchery-produced Kasilof River early-run Chinook salmon by age and sex, 2003.

<sup>a</sup> Values given by age and sex may not sum to totals due to rounding errors.

<sup>b</sup> The unmarked fraction of hatchery-produced fish was not corrected for because the number of fish in the sample was minimal.

<sup>c</sup> Sport harvest of naturally-produced Chinook salmon prohibited by regulation.

<sup>d</sup> Harvest estimate generated from SWHS (Kathrin Sundet, ADF&G research analyst, Anchorage, Alaska, personal communication). The creel sampling design did not allow for harvest estimates to be generated.

The age composition of naturally-produced fish sampled from the harvest was 21.5% (SE = 3.4%) ocean-age-2, 72.2% (SE = 3.7%) ocean-age-3, and 6.3% (SE = 2.0%) ocean-age-4 fish (Table 9). The sex composition was 54.2% females and 45.8% males (SE = 4.2%). Mean length of naturally-produced fish was 783 mm (SE = 8), where males measured 762 mm (SE = 13) and females measured 802 mm (SE = 8). The age composition of harvest for hatchery-produced fish was comprised of 18.4% (SE = 2.3%) ocean-age-2, 80.9% (SE = 2.3%) ocean-age-3, and 0.7% (SE = 0.5%) ocean-age-4 fish (Table 9). The sex composition was 57.0% females and 43.0% males (SE = 2.9%). Mean length of hatchery-produced fish was 760 mm (SE = 3), where males measured 763 mm (SE = 6) and females measured 758 mm (SE = 3).

All estimates of age and sex of naturally- and hatchery-produced Chinook salmon satisfied the project precision objective (RI95 = 0.10 for naturally-produced Chinook salmon and RI95=.075 for hatchery-produced Chinook salmon).

#### 2006

Both naturally- and hatchery-produced fish were harvested during the 2006 Kasilof River earlyrun Chinook salmon sport fishery. Creel survey technicians collected ASL information from 349 Chinook salmon during the sampling period. The age composition from the total harvest was

Parameter	2	3	4	Total <sup>a</sup>
Hatchery-produced <sup>b</sup>				
Female $(N)$	83	243	19	345
% (SE)	14.3% (1.5%)	41.8% (2.0%)	3.3% (0.7%)	59.4% (2.0%)
Harvest estimate (SE)	344 (52)	1,007 (123)	79 (20)	1,429 (168)
Mean MEF length (SE)	652 (4)	755 (2)	850 (6)	735 (3)
MEF length range	545-749	645-845	816-891	545-891
Male $(N)$	141	90	5	236
% (SE)	24.3% (1.8%)	15.5% (1.5%)	0.9% (0.4%)	40.6% (2.0%)
Harvest estimate (SE)	584 (78)	373 (55)	21 (9)	978 (120)
Mean MEF length (SE)	633 (3)	764 (5)	857 (39)	688 (5)
MEF length range	510-721	613-895	774-985	510-985
Male & female combined $(N)$	224	333	24	581
% (SE)	38.6% (2.0%)	57.3% (2.1%)	4.1% (0.8%)	100.0% (0.0%)
Harvest estimate (SE)	928 (115)	1,380 (163)	99 (23)	2,407 (271)
Mean MEF length (SE)	640 (3)	757 (2)	824 (8)	761 (6)
MEF length range	510-749	613-895	774-985	510-985

Table 8.-Creel survey estimates of harvest and length of hatchery-produced Kasilof River early-run Chinook salmon by age and sex, 2004.

<sup>a</sup> Values given by age and sex may not sum to totals due to rounding errors.

<sup>b</sup> Sport fishing regulations prohibited the harvest of naturally-produced Chinook salmon.

23.5% (SE = 2.3%) ocean-age-2, 57.9% (SE = 2.6%) ocean-age-3, and 18.6% (SE = 2.1%) ocean-age-4 fish (Table 10). The sex composition of the total harvest was 46.4% females and 53.6% males (SE = 2.7%). Mean length of all fish sampled was 749 mm (SE = 5), where males measured 725 mm (SE = 7) and females measured 776 mm (SE = 5).

The age composition of naturally-produced fish sampled from the harvest was 19.2% (SE = 2.4%) ocean-age-2, 60.5% (SE = 3.0%) ocean-age-3, and 20.3% (SE = 2.5%) ocean-age-4 fish (Table 10). The sex composition was 47.1% females and 52.9% males (SE = 3.1%). Mean length of naturally-produced fish was 760 mm (SE = 6), where males measured 739 mm (SE = 9) and females measured 782 mm (SE = 6). The age composition of hatchery-produced fish sampled from the harvest was 36.4% (SE = 5.2%) ocean-age-2, 50.0% (SE = 5.4%) ocean-age-3, and 13.6% (SE = 3.7%) ocean-age-4 fish (Table 10). The sex composition was 44.3% females and 55.7% males (SE = 5.3%). Mean length of hatchery-produced fish was 718 mm (SE = 8), where males measured 688 mm (SE = 11) and females measured 756 mm (SE = 10).

All estimates of age and sex of naturally- and hatchery-produced Chinook salmon satisfied the project precision objective (RI95 = 0.10).

#### 2007

Both naturally- and hatchery-produced fish were harvested during the 2007 Kasilof River early-run Chinook salmon sport fishery. Creel survey technicians collected ASL information from 269 Chinook salmon during the sampling period. The age composition from the total harvest was 16.7% (SE = 2.3%) ocean-age-2, 61.0% (SE = 3.0%) ocean-age-3, and 22.3% (SE = 2.5%) ocean-age-4 fish (Table 11). The sex composition of the total harvest was 54.3% females

		Ocean-age <sup>a</sup>		
Parameter	2	3	4	Total <sup>a</sup>
Naturally- and hatchery-produced cor	mbined			
Female $(N)$	39	201	5	245
% (SE)	8.9% (1.4%)	46.0% (2.4%)	1.1% (0.5%)	56.1% (2.4%)
Harvest estimate (SE)	238 (44)	1,226 (140)	30 (14)	1,494 (165)
Mean MEF length (SE)	707 (7)	779 (3)	941 (25)	772 (4)
MEF length range	591-775	683-919	860-1,002	591-1,002
Male $(N)$	46	140	6	192
% (SE)	10.5% (1.5%)	32.0% (2.2%)	1.4% (0.6%)	43.9% (2.4%)
Harvest estimate (SE)	281 (40)	854 (89)	37 (12)	1,171 (116)
Mean MEF length (SE)	672 (10)	786 (4)	921 (18)	763 (6)
MEF length range	534-840	678-920	835-960	534-960
Male and female combined $(N)$	85	341	11	437
% (SE)	19.5% (1.9%)	78.0% (2.0%)	2.5% (0.8%)	100.0% (0.0%)
Harvest estimate (SE)	518 (73)	2,080 (219)	67 (21)	2,665 (272)
Mean MEF length (SE)	688 (7)	782 (3)	930 (15)	767 (3)
MEF length range	534-840	678-920	835-1,002	534-1,002
Naturally-produced <sup>b</sup>				
Female $(N)$	7	66	5	78
% (SE)	4.9% (1.8%)	45.8% (4.2%)	3.5% (1.5%)	54.2% (4.2%)
Harvest estimate (SE)	28 (11)	262 (43)	20 (9)	310 (49)
Mean MEF length (SE)	695 (29)	801 (6)	941 (25)	802 (8)
MEF length range	591-767	691-919	860-1,002	591-1,002
Male $(N)$	24	38	4	66
% (SE)	16.7% (3.1%)	26.4% (3.7%)	2.8% (1.4%)	45.8% (4.2%)
Harvest estimate (SE)	95 (22)	151 (30)	16 (8)	262 (43)
Mean MEF length (SE)	657 (16)	811 (9)	943 (6)	762 (13)
MEF length range	534-840	702-920	935-960	534-960
Male and female combined $(N)$	31	104	9	144
% (SE)	21.5% (3.4%)	72.2% (3.7%)	6.3% (2.0%)	100.0% (0.0%)
Harvest estimate (SE)	123 (26)	413 (61)	36 (12)	572 (79)
Mean MEF length (SE)	665 (14)	804 (5)	942 (13)	783 (8)
MEF length range	534-840	691-920	860-1,002	534-1,002
Hatchery-produced				
Female $(N)$	32	135	0	167
% (SE)	10.9% (1.8%)	46.1% (2.9%)	0.0% (0.0%)	57.0% (2.9%)
Harvest estimate (SE)	229 (46)	964 (125)	0 (0)	1,193 (148)
Mean MEF length (SE)	709 (6)	769 (3)	NA	758 (3)
MEF length range	653-775	683-891	NA	653-891
Male $(N)$	22	102	2	126
% (SE)	7.5% (1.5%)	34.8% (2.8%)	0.7% (0.5%)	43.0% (2.9%)
Harvest estimate (SE)	157 (37)	729 (101)	14 (10)	900 (119)
Mean MEF length (SE)	689 (12)	777 (5)	877 (42)	763 (6)
MEF length range	549-780	678-916	835-919	549-919
Male and female combined $(N)$	54	237	2	293
% (SE)	18.4% (2.3%)	80.9% (2.3%)	0.7% (0.5%)	100.0% (0.0%)
Harvest estimate (SE)	386 (64)	1,693 (198)	14 (10)	2,093 (238)
Mean MEF length (SE)	701 (6)	772 (3)	877 (42)	760 (3)
MEF length range	549-780	678-916	835-919	549-919

Table 9.-Creel survey estimates of harvest and length of Kasilof River earlyrun Chinook salmon by age and sex, 2005.

<sup>a</sup> Values given by age and sex may not sum to totals due to rounding errors.

<sup>b</sup> The naturally-produced Chinook salmon fishery was only open on Tuesdays and Saturdays.

	Ocean-age <sup>a</sup>					
Parameter	2	3	4	Total <sup>a</sup>		
Naturally- and hatchery-produced co	mbined					
Female $(N)$	11	107	44	162		
% (SE)	3.2% (0.9%)	30.7% (2.5%)	12.6% (1.8%)	46.4% (2.7%)		
Harvest estimate (SE)	78 (24)	763 (87)	314 (51)	1,155 (114)		
Mean MEF length (SE)	626 (12)	765 (4)	841 (7)	776 (5)		
MEF length range	551-688	630-890	740-926	551-926		
Male $(N)$	71	95	21	187		
% (SE)	20.3% (2.2%)	27.2% (2.4%)	6.0% (1.3%)	53.6% (2.7%)		
Harvest estimate (SE)	506 (42)	678 (51)	150 (20)	1,334 (84)		
Mean MEF length (SE)	627 (5)	764 (5)	882 (16)	725 (7)		
MEF length range	520-691	625-855	810-1,079	520-1,079		
Male and female combined $(N)$	82	202	65	349		
% (SE)	23.5% (2.3%)	57.9% (2.6%)	18.6% (2.1%)	100.0% (0.0%)		
Harvest estimate (SE)	585 (73)	1,441 (133)	464 (64)	2,489 (200)		
Mean MEF length (SE)	627 (4)	765 (3)	855 (7)	749 (5)		
MEF length range	520-691	625-890	740-1,079	520-1,079		
Naturally-produced <sup>b</sup>						
Female $(N)$	8	79	36	123		
% (SE)	3.1% (1.1%)	30.3% (2.8%)	13.8% (2.1%)	47.1% (3.1%)		
Harvest estimate (SE)	32 (12)	320 (42)	146 (26)	498 (56)		
Mean MEF length (SE)	615 (14)	770 (5)	847 (7)	782 (6)		
MEF length range	551-655	668-890	740-926	551-926		
Male $(N)$	42	79	17	138		
% (SE)	16.1% (2.3%)	30.3% (2.8%)	6.5% (1.5%)	52.9% (3.1%)		
Harvest estimate (SE)	170 (29)	320 (42)	69 (17)	559 (60)		
Mean MEF length (SE)	619 (7)	771 (6)	890 (19)	739 (9)		
MEF length range	520-691	625-855	810-1,079	520-1,079		
Male and female combined $(N)$	50	158	53	261		
% (SE)	19.2% (2.4%)	60.5% (3.0%)	20.3% (2.5%)	100.0% (0.0%)		
Harvest estimate (SE)	202 (32)	640 (66)	215 (33)	1,057 (96)		
Mean MEF length (SE)	618 (6)	770 (4)	861 (8)	760 (6)		
MEF length range	520-691	625-890	740-1,079	520-1,079		
Hatchery-produced						
Female $(N)$	3	28	8	39		
% (SE)	3.4% (1.9%)	31.8% (5.0%)	9.1% (3.1%)	44.3% (5.3%)		
Harvest estimate (SE)	49 (28)	456 (84)	130 (46)	635 (98)		
Mean MEF length (SE)	653 (18)	752 (9)	813 (19)	756 (10)		
MEF length range	630-688	630-860	750-885	630-885		
Male (N)	29	16	4	49		
% (SE)	33.0% (5.0%)	18.2% (4.1%)	4.5% (2.2%)	55.7% (5.3%)		
Harvest estimate (SE)	472 (85)	260 (64)	65 (32)	797 (109)		
Mean MEF length (SE)	639 (5)	735 (12)	847 (16)	688 (11)		
MEF length range	587-690	670-840	810-879	587-879		
Male and female combined $(N)$	32	44	12	88		
% (SE)	36.4% (5.2%)	50.0% (5.4%)	13.6% (3.7%)	100.0% (0.0%)		
Harvest estimate (SE)	521 (89)	716 (104)	195 (56)	1,432 (140)		
Mean MEF length (SE)	641 (5)	746 (7)	825 (14)	718 (8)		
MEF length range	587-690	630-860	750-885	587-885		

Table 10.-Creel survey estimates of harvest and length of Kasilof River earlyrun Chinook salmon by age and sex, 2006.

<sup>a</sup> Values given by age and sex may not sum to totals due to rounding errors.

<sup>b</sup> The naturally-produced Chinook salmon fishery was only open on Tuesdays, Thursdays, and Saturdays.

	Ocean-age <sup>a</sup>					
Parameter	2	3	4	Total <sup>a</sup>		
Naturally- and hatchery-produced co	mbined					
Female $(N)$	8	104	34	146		
% (SE)	3.0% (1.0%)	38.7% (3.0%)	12.6% (2.0%)	54.3% (3.0%)		
Harvest estimate (SE)	79 (29)	1,026 (153)	335 (69)	1,440 (201)		
Mean MEF length (SE)	659 (31)	783 (4)	853 (8)	795 (5)		
MEF length range	560-853	660-875	780-975	560-975		
Male (N)	37	60	26	123		
% (SE)	13.8% (2.1%)	22.3% (2.5%)	9.7% (1.8%)	45.7% (3.0%)		
Harvest estimate (SE)	365 (42)	592 (59)	257 (34)	1,214 (101)		
Mean MEF length (SE)	642 (6)	769 (5)	862 (16)	751 (9)		
MEF length range	570-695	645-860	750-1,190	570-1,190		
Male and female combined $(N)$	45	164	60	269		
% (SE)	16.7% (2.3%)	61.0% (3.0%)	22.3% (2.5%)	100.0% (0.0%)		
Harvest estimate (SE)	444 (83)	1,618 (222)	592 (101)	2,654 (340)		
Mean MEF length (SE)	645 (7)	778 (3)	857 (8)	773 (5)		
MEF length range	560-853	645-875	750-1,190	560-1,190		
Naturally-produced <sup>b</sup>						
Female $(N)$	2	34	23	59		
% (SE)	1.6% (1.1%)	27.2% (4.0%)	18.4% (3.5%)	47.2% (4.5%)		
Harvest estimate (SE)	18 (13)	301 (64)	204 (49)	523 (94)		
Mean MEF length (SE)	595 (35)	780 (7)	865 (9)	807 (9)		
MEF length range	560-630	700-855	810-975	560-975		
Male (N)	15	33	18	66		
% (SE)	12.0% (2.9%)	26.4% (4.0%)	14.4% (3.2%)	52.8% (4.5%)		
Harvest estimate (SE)	133 (38)	292 (62)	159 (42)	584 (102)		
Mean MEF length (SE)	640 (10)	767 (8)	881 (21)	769 (13)		
MEF length range	570-680	645-860	815-1,190	570-1,190		
Male and female combined $(N)$	17	67	41	125		
% (SE)	13.6% (3.1%)	53.6% (4.5%)	32.8% (4.2%)	100.0% (0.0%)		
Harvest estimate (SE)	151 (41)	593 (103)	363 (72)	1,107 (170)		
Mean MEF length (SE)	635 (10)	774 (5)	872 (10)	803 (7)		
MEF length range	560-680	645-860	810-1,190	560-1,190		
Hatchery-produced						
Female $(N)$	6	70	11	87		
% (SE)	4.2% (1.7%)	48.6% (4.2%)	7.6% (2.2%)	60.4% (4.1%)		
Harvest estimate (SE)	64 (27)	752 (115)	118 (37)	935 (134)		
Mean MEF length (SE)	681 (37)	785 (4)	826 (12)	783 (5)		
MEF length range	600-853	660-875	780-890	600-890		
Male $(N)$	22	27	8	57		
% (SE)	15.3% (3.0%)	18.8% (3.3%)	5.6% (1.9%)	39.6% (4.1%)		
Harvest estimate (SE)	236 (55)	290 (62)	86 (31)	612 (100)		
Mean MEF length (SE)	643 (7)	772 (7)	821 (13)	729 (10)		
MEF length range	570-695	702-832	750-870	570-870		
Male and female combined $(N)$	28	97	19	144		
% (SE)	19.4% (3.3%)	67.4% (3.9%)	13.2% (2.8%)	100.0% (0.0%)		
Harvest estimate (SE)	301 (63)	1,042 (145)	204 (51)	1,547 (196)		
Mean MEF length (SE)	651 (10)	781 (4)	824 (8)	761 (6)		
MEF length range	570-853	660-875	750-890	570-890		

Table 11.-Creel survey estimates of harvest and length of Kasilof River early-run Chinook salmon by age and sex, 2007.

<sup>a</sup> Values given by age and sex may not sum to totals due to rounding errors.
 <sup>b</sup> The naturally-produced Chinook salmon fishery was only open on Tuesdays, Thursdays, and Saturdays.

and 45.7% males (SE = 3.0%). Mean length of all fish sampled was 773 mm (SE = 5), where males measured 751 mm (SE = 9) and females measured 795 mm (SE = 5).

The age composition of naturally-produced fish sampled from the harvest was 13.6% (SE = 3.1%) ocean-age-2, 53.6% (SE = 4.5%) ocean-age-3, and 32.8% (SE = 4.2%) ocean-age-4 fish (Table 11). The sex composition was 47.2% females and 52.8% males (SE = 4.5%). Mean length of naturally-produced fish was 803 mm (SE = 7), where males measured 769 mm (SE = 13) and females measured 807 mm (SE = 9). The age composition of hatchery-produced fish sampled from the harvest was 19.4% (SE = 3.3%) ocean-age-2, 67.4% (SE = 3.9%) ocean-age-3, and 13.2% (SE = 2.8%) ocean-age-4 fish (Table 11). The sex composition was 60.4% females and 39.6% males (SE = 4.1%). Mean length of hatchery-produced fish was 761 mm (SE = 6), where males measured 729 mm (SE = 10) and females measured 783 mm (SE = 5).

All estimates of age and sex of naturally- and hatchery-produced Chinook salmon satisfied the project precision objective (RI95 = 0.10).

#### 2008

Both naturally- and hatchery-produced fish were harvested during the 2008 Kasilof River early-run Chinook salmon sport fishery. Creel survey technicians collected ASL information from 207 Chinook salmon during the sampling period. The age composition from the total harvest was 11.1% (SE = 2.2%) ocean-age-2, 70.5% (SE = 3.2%) ocean-age-3, and 18.4% (SE = 2.7%) ocean-age-4 fish (Table 12). The sex composition of the total harvest was 63.3% females and 36.7% males (SE = 3.4%). Mean length of all fish sampled was 780 mm (SE = 5), where males measured 758 mm (SE = 9) and females measured 794 mm (SE = 5).

The age composition of naturally-produced fish sampled from the harvest was 3.6% (SE = 2.0%) ocean-age-2, 59.5% (SE = 5.4%) ocean-age-3, and 36.9% (SE = 5.3%) ocean-age-4 fish (Table 12). The sex composition was 57.1% females and 42.9% males (SE = 5.4%). Mean length of naturally-produced fish was 800 mm (SE = 7), where males measured 783 mm (SE = 11) and females measured 812 mm (SE = 9.0). The age composition of hatchery-produced fish sampled from the harvest was 16.3% (SE = 3.3%) ocean-age-2, 78.0% (SE = 3.7%) ocean-age-3, and 5.7% (SE = 2.1%) ocean-age-4 fish (Table 12). The sex composition was 67.5% females and 32.5% males (SE = 4.2%). Mean length of hatchery-produced fish was 767 mm (SE = 6), where males measured 735 mm (SE = 12) and females measured 782 mm (SE = 6).

All estimates of age and sex of naturally- and hatchery-produced Chinook salmon satisfied the project precision objective (RI95 = 0.10).

### DISCUSSION

Run timing differs between naturally- and hatchery-produced Chinook salmon. Naturallyproduced fish generally appear in the fishery earlier as catch is higher at the beginning of the fishery and rarely falls below 50% of the total catch throughout the creel sampling period (Figure 2).

Despite many regulatory changes imposed on the Kasilof River sport fishery, overall harvest levels of both naturally- and hatchery-produced Chinook salmon were similar between 2004 and 2007 with a mean harvest of 2,554 fish (Figure 3). The 2008 harvest estimate (1,984 Chinook salmon) was less than in previous years. This decline could reflect a smaller return because sport fishing regulations were liberalized during this period. Harvest of naturally-produced Chinook

	Ocean-age <sup>a</sup>					
Parameter	2	3	4	Total <sup>a</sup>		
Naturally- and hatchery-produced co	mbined					
Female $(N)$	4	98	29	131		
% (SE)	1.9% (1.0%)	47.3% (3.5%)	14.0% (2.4%)	63.3% (3.4%)		
Harvest estimate (SE)	38 (20)	939 (160)	278 (64)	1,256 (204)		
Mean MEF length (SE)	629 (23)	785 (4)	843 (9)	794 (5)		
MEF length range	560-660	660-870	755-970	560-970		
Male $(N)$	19	48	9	76		
% (SE)	9.2% (2.0%)	23.2% (2.9%)	4.3% (1.4%)	36.7% (3.4%)		
Harvest estimate (SE)	182 (29)	460 (55)	86 (18)	728 (80)		
Mean MEF length (SE)	664 (10)	779 (7)	848 (12)	758 (9)		
MEF length range	600-730	685-880	780-895	600-895		
Male and female combined $(N)$	23	146	38	207		
% (SE)	11.1% (2.2%)	70.5% (3.2%)	18.4% (2.7%)	100.0% (0.0%)		
Harvest estimate (SE)	220 (55)	1,399 (224)	364 (77)	1,984 (305)		
Mean MEF length (SE)	658 (9)	783 (4)	844 (7)	780 (5)		
MEF length range	560-730	660-880	755-970	560-970		
Naturally-produced <sup>b</sup>						
Female $(N)$	1	23	24	48		
% (SE)	1.2% (1.2%)	27.4% (4.9%)	28.6% (5.0%)	57.1% (5.4%)		
Harvest estimate (SE)	10 (10)	228 (60)	238 (62)	475 (104)		
Mean MEF length (SE)	560 (0)	793 (6)	841 (10)	812 (9)		
MEF length range	560-560	750-860	755-970	560-970		
Male $(N)$	2	27	7	36		
% (SE)	2.4% (1.7%)	32.1% (5.1%)	8.3% (3.0%)	42.9% (5.4%)		
Harvest estimate (SE)	20 (14)	267 (68)	69 (28)	357 (83)		
Mean MEF length (SE)	645 (25)	773 (10)	861 (9)	783 (11)		
MEF length range	620-670	685-880	820-895	620-895		
Male and female combined $(N)$	3	50	31	84		
% (SE)	3.6% (2.0%)	59.5% (5.4%)	36.9% (5.3%)	100.0% (0.0%)		
Harvest estimate (SE)	30 (18)	495 (108)	307 (75)	832 (165)		
Mean MEF length (SE)	617 (32)	782 (6)	846 (8)	800 (7)		
MEF length range	560-670	685-880	755-970	560-970		
Hatchery-produced						
Female $(N)$	3	75	5	83		
% (SE)	2.4% (1.4%)	61.0% (4.4%)	4.1% (1.8%)	67.5% (4.2%)		
Harvest estimate (SE)	28 (16)	688 (128)	46 (21)	762 (139)		
Mean MEF length (SE)	652 (6)	783 (5)	852 (6)	782 (6)		
MEF length range	640-660	660-870	830-865	640-870		
Male $(N)$	17	21	2	40		
% (SE)	13.8% (3.1%)	17.1% (3.4%)	1.6% (1.1%)	32.5% (4.2%)		
Harvest estimate (SE)	156 (44)	193 (50)	18 (13)	367 (79)		
Mean MEF length (SE)	666 (11)	786 (10)	800 (20)	735 (12)		
MEF length range	600-730	690-870	780-820	600-870		
Male and female combined $(N)$	20	96	7	123		
% (SE)	16.3% (3.3%)	78.0% (3.7%)	5.7% (2.1%)	100.0% (0.0%)		
Harvest estimate (SE)	184 (49)	881 (156)	64 (26)	1,129 (193)		
Mean MEF length (SE)	664 (9)	784 (5)	837 (11)	767 (6)		
MEF length range	600-730	660-870	780-865	600-870		

Table 12.-Creel survey estimates of harvest and length of Kasilof River early-run Chinook salmon by age and sex, 2008.

<sup>a</sup> Values given by age and sex may not sum to totals due to rounding errors.

<sup>b</sup> The naturally-produced Chinook salmon fishery was only open on Tuesdays, Thursdays, and Saturdays.



*Note:* "catch" = fish harvested plus fish released (Jennings et al. 2010).

Figure 2.-Naturally-produced proportion of the Kasilof River early-run Chinook salmon sport catch, 2003–2008.



*Note:* "catch" = fish harvested plus fish released; "harvest" = fish kept (Jennings et al. 2010).

<sup>a</sup> Sport harvest of naturally-produced Chinook salmon prohibited by regulation.

Figure 3.-Creel survey estimates of naturally- and hatchery-produced Kasilof River early-run Chinook salmon sport catch and harvest, 2004–2008.

salmon increased proportionately with regulatory changes and dropped slightly in 2008. Harvest of hatchery-produced Chinook salmon has been declining since 2004 with a minimal increase in 2007 (Figure 3). Catch for both naturally- and hatchery-produced Chinook salmon illustrate a decreasing trend. Catch estimates for naturally-produced Chinook salmon have shown a decreasing trend starting in 2007 and hatchery-produced Chinook salmon since 2004 with only a small increase in 2007 (Figure 3).

These trends are also demonstrated by different user groups and methods. Guided and unguided angler harvest estimates appear stable while catch estimates are declining (Figure 4). Similarly, boat and shore angler harvest and catch estimates follow the same pattern (Figure 5). Comparison of harvest and catch estimates for these users groups clearly establishes that guided anglers catch and harvest substantially more fish than unguided anglers and that boat anglers also catch and harvest more fish than shore anglers, especially in later years (Figures 4 and 5).

Participation in the fishery has remained relatively consistent since 2004, with the exception of a small increase in 2006 (Figures 4 and 5). The number of unguided anglers exceeded the number of guided anglers participating in the fishery, with similar numbers of angler-hours dedicated to the fishery. Similar numbers of shore anglers and boat anglers participate in the fishery; however, shore fisherman fish for substantially less time than boat anglers (Figure 5). This is most likely affected by the overall proximity of boat take-out sites and the accessibility of the Crooked Creek State Recreation Site.

Participation in the fishery varies between days when naturally-produced harvest is allowed or prohibited. Since 2005, most anglers have demonstrated the preference to fish on days when harvest of naturally-produced Chinook salmon is permitted. The only exception was in 2005, when more guided anglers fished when only hatchery-produced fish were allowed to be harvested (Table 13). This probably occurred because many guided trips had been booked prior to Alaska Board of Fisheries regulatory action. Otherwise, angler effort clearly illustrated delineation between naturally- and hatchery-produced harvest days. Since the inception of naturally-produced harvest restrictions in 2005, more anglers have participated on days when naturally-produced Chinook salmon could be retained. Anglers who participate on days when naturally-produced Chinook salmon could be retained also fish for longer periods as evidenced by the larger increases in the number of angler-hours compared to the number of anglers (Table 13).

The percentage of the naturally-produced Chinook salmon catch which was harvested varied with different management regimes. In 2005, when anglers could harvest naturally-produced fish 2 days of the week (29% of the season), the harvest was approximately 19% of the catch (Table 14). In later years (2006–2008), harvest was approximately 35 to 44% of the catch. Because 43% of the season (3 days/7 days) was open to harvest of naturally-produced Chinook salmon, anglers appeared to maximize this harvest opportunity. Each day when naturally-produced harvest was allowed was separated by at least 1 day when naturally-produced harvest was prohibited. This alternate spacing of fishery openings and closures appears to have minimized any compensatory effects from the recreational fishers 'fishing down' naturally-produced Chinook salmon. If 'fishing down' were occurring, naturally-produced Chinook salmon percent harvest from catch would be greater than the percentage of angler effort during the week (i.e. percentage of the week open to retention of naturally-produced Chinook salmon).



*Note:*  $n_g$  = the estimated number of guided anglers;  $n_u$  = the estimated number of unguided anglers.

 $(n_u=10,838)$   $(n_u=8,290)$ 

 $(n_u = 8,836)$ 

 $(n_u=7,688)$ 

 $(n_u = 7,439)$ 

Figure 4.-Creel survey estimates of guided and unguided anglers Kasilof River early-run Chinook salmon catch, harvest, and effort, 2004–2008.



*Note:*  $n_b$  = the estimated number of boat anglers;  $n_s$  = the estimated number of shore anglers. *Note:* axis scale differs between graphs.

Figure 5.-Creel survey estimates of boat and shore anglers Kasilof River early-run Chinook salmon catch, harvest, and effort, 2004–2008.

	Days when naturally-produced harvest is allowed <sup>a</sup>		Days when naturally-			Days when na	turally-produced har	vest is prohibited <sup>b</sup>
		Days fished	Eff	ort	Days fished	Eff	ort	
Category	Year	per week	Angler-hours	No. of anglers	per week	Angler-hours	No. of anglers	
Guided anglers	2005	2	9,057	1,265	5	23,784	3,349	
-	2006	3	18,809	2,755	4	19,256	2,656	
	2007	3	18,872	2,685	4	13,492	1,940	
	2008	3	16,934	2,349	4	14,427	2,128	
Unguided anglers	2005	2	14,613	4,068	5	13,140	3,371	
	2006	3	20,843	5,427	4	16,351	5,412	
	2007	3	18,693	4,952	4	10,186	3,338	
	2008	3	16,819	4,848	4	13,632	3,988	
Total <sup>c</sup>	2005	2	23,669	5,333	5	36,923	6,721	
	2006	3	39,651	8,181	4	35,607	8,067	
	2007	3	37,565	7,637	4	23,677	5,278	
	2008	3	33,753	7,196	4	28,060	6,116	

Table 13.-Creel survey estimates of Kasilof River early-run Chinook salmon guided and unguided angler effort, 2005–2008.

<sup>a</sup> Tuesday and Saturday in 2005; Tuesday, Thursday, and Saturday from 2006 through 2008.

<sup>b</sup> Monday, Wednesday, Thursday, Friday and Sunday in 2005; Monday, Wednesday, Friday, and Sunday from 2006 through 2008.

<sup>c</sup> Totals may not sum due to rounding errors.

The percentage of hatchery-produced Chinook salmon catch which was harvested varied less under different management regimes with respect to the days open to harvest of naturally-produced Chinook salmon. Harvest of hatchery-produced Chinook salmon remained a relatively uniform percentage (79–86%) of the hatchery-produced catch from 2004–2007 (Table 14). The relationship is counterintuitive because anglers harvested a large percentage of their hatchery-produced catch during years when they had more naturally-produced harvest opportunity. In 2008, the harvest opportunity of hatchery-produced Chinook salmon was maximized by regulatory changes that allowed the harvest of two Chinook salmon (only one of which could be naturally-produced on Tuesday, Thursday and Saturday), 7 days a week. Anglers responded by harvesting 92% of the hatchery-produced Chinook salmon they caught (Table 14).

Anglers harvested a greater percentage of hatchery-produced fish caught on days when harvest of naturally-produced fish was prohibited until 2008. On days when naturally-produced harvest was allowed (Tuesday, Thursday, and Saturday), the harvest of hatchery-produced Chinook salmon ranged from 79% to 83% of the catch from 2005–2007 (Table 15). On days when harvest of naturally-produced fish was prohibited (Sunday, Monday, Wednesday, and Friday), harvest of hatchery-produced Chinook salmon ranged from 88% to 90% of the catch from 2005–2007. This relationship changed in 2008 after regulatory changes allowed the harvest of two Chinook salmon (only one of which could be naturally-produced on Tuesday, Thursday and Saturday), 7 days a week. In 2008, anglers harvested a lesser percentage of hatchery-produced fish caught on days when harvest of naturally-produced fish was 94% of hatchery-produced fish caught versus 91% on days when naturally-produced harvest was prohibited (Table 15). This angler use pattern demonstrates a greater propensity to harvest hatchery-produced fish caught on naturally-produced Chinook salmon harvest days in 2008 than in previous years.

	Angle	er effort <sup>a</sup>	Naturally-produced Chinook salmon			Hatchery-produced Chinook salr			
	Days	Percent	Harves	st		Harves	st		
Year	fished	per week	No. of fish	Percent	Catch	No. of fish	Percent	Catch	
2004	0	0%	0	0%	3,023	2,407	79%	3,066	
2005	2	29%	572	19%	2,971	2,093	85%	2,476	
2006	3	43%	1,057	35%	3,006	1,432	86%	1,661	
2007	3	43%	1,107	44%	2,488	1,547	85%	1,810	
2008	3	43%	832	44%	1,902	1,129	92%	1,222	

Table 14.-Naturally- and hatchery-produced Kasilof River early-run Chinook salmon estimated harvest, catch, and angler effort, 2004–2008.

<sup>a</sup> Values given only for days open to naturally-produced Chinook salmon harvest.

Table 15.-Kasilof River early-run percentage of hatchery-produced Chinook salmon harvested by day of the week, 2005–2008.

					Monday, W	, Friday	
	Tuesd	ay, Thursday	and	l Sunday <sup>b</sup>			
	Days Harvest			Harve			
Year	fished	No. of fish	Percent	Catch	No. of fish	Percent	Catch
2005	2	683	79%	869	1,410	88%	1,607
2006	3	669	83%	808	763	90%	852
2007	3	864	83%	1,045	683	89%	764
2008	3	586	94%	626	544	91%	596

<sup>a</sup> Tuesday and Saturday in 2005; Tuesday, Thursday, and Saturday from 2006 through 2008.

<sup>b</sup> Monday, Wednesday, Thursday, Friday and Sunday in 2005; Monday, Wednesday, Friday, and Sunday from 2006 through 2008.

Age, sex, and length sampling indicates that naturally-produced fish are larger in size than hatchery-produced fish (Figure 6). Additionally, females of both naturally- and hatchery-produced origin tend to be the larger sex. Age-1.3 fish are the dominant age-class in the harvest, followed by age-1.2 and age-1.4 (Figure 7). Most of the age-1.4 harvest comes from naturally-produced fish such that the larger average size may be partially explained by greater age-at-maturity of naturally-produced Chinook salmon.

No comparable data exists to evaluate regulatory decisions made in 2005 at BOF meetings with regard to "People Hole" located at Crooked Creek State Recreation Site. This regulation prohibits fishing from an anchored boat near the confluence of Crooked Creek. Although it is unknown how this regulation has impacted shore angler Chinook salmon catch and harvest success, data collected since 2004 has indicated that catch levels are decreasing with relatively little change in overall harvest or effort from shore anglers at Crooked Creek State Recreation Site (Figure 5).



<sup>a</sup> Sport harvest of naturally-produced Chinook salmon prohibited by regulation.

Figure 6.-Creel survey estimates of naturally- and hatchery-produced Kasilof River early-run Chinook salmon mean length composition, 2003–2008.



<sup>a</sup> Sport harvest of naturally-produced Chinook salmon prohibited by regulation.

Figure 7.-Creel survey estimates of Kasilof River early-run Chinook salmon sport harvest by age, 2003–2008.

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# APPENDIX A. KASILOF RIVER EARLY-RUN CHINOOK SALMON AGE, SEX, AND LENGTH COMPOSITION, 2002

	Ocean-age					
Parameter	2	3	4	Total <sup>a</sup>		
Non-AFC						
Female $(N)$	7	78	9	94		
% (SE)	4.1% (1.5%)	46.2% (3.8%)	5.3% (1.7%)	55.6% (3.8%)		
Mean MEF length (SE)	671 (31)	769 (5)	862 (17)	771 (7)		
MEF length range	560-775	617-902	780-965	560-965		
Male $(N)$	15	49	11	75		
% (SE)	8.9% (2.2%)	29.0% (3.5%)	6.5% (1.9%)	44.4% (3.8%)		
Mean MEF length (SE)	637 (17)	764 (8)	859 (15)	752 (10)		
MEF length range	550-745	660-900	740-927	550-927		
Male and female combined $(N)$	22	127	20	169		
% (SE)	13.0% (2.6%)	75.1% (3.3%)	11.8% (2.5%)	100.0% (0.0%)		
Mean MEF length (SE)	648 (15)	767 (4)	860 (11)	763 (6)		
MEF length range	550-775	617-902	740-965	550-965		
AFC						
Female $(N)$	24	47	1	72		
% (SE)	18.8% (3.5%)	36.7% (4.3%)	0.8% ( $0.8%$ )	56.3% (4.4%)		
Mean MEF length (SE)	635 (7)	738 (7)	871 (0)	705 (8)		
MEF length range	541-692	583-810	871	541-871		
Male $(N)$	39	15	2	56		
% (SE)	30.5% (4.1%)	11.7% (2.9%)	1.6% (1.1%)	43.8% (4.4%)		
Mean MEF length (SE)	623 (5)	719 (16)	866 (36)	657 (10)		
MEF length range	522-680	623-815	830-901	522-901		
Male and female combined $(N)$	63	62	3	128		
% (SE)	49.2% (4.4%)	48.4% (4.4%)	2.3% (1.3%)	100.0% (0.0%)		
Mean MEF length (SE)	628 (4)	733 (7)	867 (21)	684 (7)		
MEF length range	522-692	583-815	830-901	522-901		

Appendix A1.-Kasilof River early-run Chinook salmon age, sex and length composition, 2002.

*Note:* "AFC" = adipose finclip.

<sup>a</sup> Harvest estimates could not be generated due to non-representative sampling of non-AFC fish and an unmarked fraction of AFC fish. Non-AFC fish were only sampled for 2 days of the fishery. Less than 100% of hatchery-produced fish were marked with AFC until smolt release year 2002.